THE AMERICAN GAS LIGHT JOURNAL

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[OFFICIAL NOTICE.]

Committee on Nomination of Officers, American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., May 25, 1894.

I hereby give official notice that, at a meeting of the Council of this Association, held at Cleveland, O., May 15, 1894, there were appointed (as per the appended list) members of the Committee to Nominate Officers for the Association for the year beginning October 19, 1894, said Committee to report to the Association on October 17, 1894, at Washington, D. C.:

F. H. Shelton (Chairman), Philadelphia, Pa.; M. S. Greenough, Cleveland, O.; D. H. Geggie, Quebec, Canada; F. S. Richardson, North Adams, Mass.; G. T. Thompson, St. Louis, Mo.

Respectfully, A. B. SLATER, JR., Secretary.

[OFFICIAL NOTICE.]

Committee of Arrangements, American Gas Light Association.

OFFICE OF THE SECRETARY, PROVIDENCE, R. I., May 25, 1894.

I hereby give official notice that at a meeting of the Council of this Association, held at Cleveland, O., May 15, 1894, there were appointed (as per the appended list) members of the Committee on Arrangments for the 22d annual meeting of this Association, to be held at Washington, D. C., beginning on October 17, 1894:

C. B. Bailey (Chairman), Washington, D. C.; J. S. McIlhenny, Washington, D. C.; Wm. Henry White, New York City; John McIlhenny, Philadelphia, Pa.; T. J. Hayward, Baltimore, Md.; C. H. Dickey, Baltimore, Md.; Frederic Egner, Norfolk, Va.; A. B. Slater, Jr., Providence, R. I.

Respectfully, A. B. SLATER, JR., Secretary.

BRIEFLY TOLD.

THE FIRST ANNUAL MEETING OF THE PACIFIC COAST GAS ASSOCIATION.—Elsewhere in this issue will be found a complete report of the First Annual Meeting of the Pacific Coast Gas Association, for a copy of which we are indebted to Mr. John A. Britton, the Association's Secretary and Treasurer. The most superficial examination of the report cannot fail to convince the examiner that the meeting was in all respects a success, the technical portion of the proceedings indeed being quite up to the mark of the Associations that have been longer in the field. The convention was favored with good weather, and the social side of the gathering was marked by many attentions bestowed in true Pacific Coast fashion by the Capital Gas Company, of Sacramento, whose courtesy was all the more worthy of remembering and enjoying when one recollected that less than a month before the Company was visited by a disastrous conflagration which demolished its electric lighting plant, entailing a loss that amounted to many thousands of dollars. It is like gilding gold to say that President Crockett was fully up to the duties of his position; but we must add that many of the "Coasters," who met him at Sacramento for the first time, were unprepared, in some measure at least, for the clever inaugural address to which they listened. Crockett, however, is nothing if not versatile, and it is little to be wondered at that the Association was unwilling to accept his refusal to serve another term in the presidential chair, without making a strong appeal to him to reconsider that determination. The declination, however was final, and his reasons were really unanswerable. His successor, Mr. Quilty, of San Jose, is the sort of man to go on with the good work, and aided by Mr. Britton, of Oakland, whose clerical connection with the Oakland Company has "made him a man of methods," there is little fear that the young Association will not go on to fame, with never a backward step.

THE BROOKLYN SITUATION.—The rate war in Brooklyn presents no particularly new phase, although we imagine the contest for business at the cut rate is not so fierce as it was perhaps a fortnight or so ago. The annual meetings of the Fulton-Municipal, Williamsburgh and Nassau Companies have been held, and so far as we can see the results in each case go to show that the parties in interest in each are to all intents and purposes the same as the ones who held control for the past year. It is true that Mr. Willets reappears in the Williamsburgh direction, and the vacancy caused by the lamented death of Mr. Morgan in the Nassau has been filled by the selection of a diplomatic gentleman whose leanings are strongly towards fortifying the White-Leggett interests, whence one's inability to say that things are not as they were before. Behind it all, though, is the unmistakable feeling that the factions are drawing closer together, and that the summer season of 1894 will witness the return of reason to the disturbers of the gas peace of Brooklyn. Another thing that this war of rates in Brooklyn has hastened by at least a twelve month is dollar gas for both that city and New York. Whether this consummation is to be welcomed or repudiated must be determined solely by the necessities of the separate Companies which it affects, although we incline to the view that the many will be constrained to accept it as a blessing in disguise.

THE MONTCLAIR (N. J.) COUNCIL AND STREET LIGHTING BY ELECTRIC INCANDESCENT LAMPS.—For some time past the Committee on Street Lighting, of the Montclair (N.J.) Common Council, has been considering the matter of the advisability of adopting incandescent electric lamps in place of gas lamps for the lighting of its streets, and from the report recently handed in it is found that "A change from our present system of gas lighting to incandescent electric lighting * * * should only be made upon a reasonable certainty that the change should be for the better interest of the town, and we do not think that the incandescent system would meet these conditions." And surely the Committee has had ample chance to witness the workings of the incandescent electric lamp as a street illuminator in towns not far from Montclair; for instance, at Madison—where there are no gas mains—at New Brunswick, at Rutherford, and other places. In fact, it must be admitted that the glow electric lamp as a factor in successful street lighting has no standing whatever, as against a gas lamp carrying a 5 (or even a 4) foot burner, consuming a 20 candle value gas.

NOTES.—At the annual election, by the stockholders of the Newark (N. J.) Gas Light Company, held at the office of the Company, on June 11th, the following Directors, being the old Board, were unanimously chosen: Eugene Vanderpool, Hon. Theodore Runyon, Col. Edward H. Wright, Marcus L. Ward, John R. Emery, Robert F. Ballantine, Wm. Franklin Murphy, Stephen H. Plum, James P. Dusenberry; and at the meeting of the Board the following officers were unanimously elected: President, Eugene Vanderpool; Vice-President, Col. Edward H. Wright. ——At the annual meeting of the shareholders in the Nassau Gas Light Company, of Brooklyn, N. Y., which was held on the 12th inst., the following Directors were elected: E D. White, Edwin Beers, F. Warren Sneden, D. G. Leggett and S.T. White.——The Delaware (O.) Gas Company crowned itself with glory on the occasion of the "lawn fete and reception" arranged by the management of the local female seminary known as Monnett Hall. The Company agreed to illuminate the grounds without cost to the seminary, and the local papers all admit that the display was notably handsome and remarkably efficient. It must have cost the Company quite a nice sum to carry out its promise, for the display entailed the placing of 4,000 feet of pipe, which supplied gas to 1,000 6-foot burners, to say nothing of the cost of fitting the bends and branches, the appropriate interpolation of fancy designs, etc. The success of the illumination, however, was such that the fair seminarists subsequently passed resolutions expressive of their satisfaction and pleasure over its excellence, and their gratitude towards the Company for its generosity. In the resolutions it is said: "* * * The campus never appeared more beautiful than on these evenings, and credit is due to Mr. T. C. Jones and the Company he represents for so generously donating the light."——The Berlin Iron Bridge Company has appointed Mr. W. E. Stearns their Purchasing Agent, to fill the vacancy caused by the death of Mr. Wm. H. Riley.——A sequel to the disastrous conflagration which recently destroyed the electric lighting annex of the Capital Gas Company, of Sacramento, Cal., is found in the issuance of an assessment call of $10 per share, the first installment of which ($5) was delinquent on the 6th inst., and the second installment will be delinquent at a day to be named in the future. The total assessment involves the sum of $100,000, which amount, together with the insurance recovered, will secure for the Company an electric lighting plant second to none on the Coast.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—Concluded from page 849.]

SEVENTEENTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT CLEVELAND, OHIO, MAY 16, 17 AND 18, 1894.

SECOND DAY—MORNING SESSION.

The President—The next business will be reading the various contributions to the

WRINKLE DEPARTMENT,

which will be presented to the Association by Mr. Geo. T. Thompson, who edited the same.

Mr. Thompson read as follows:

SOME RETORT HOUSE DEVICES.

I. It is unnecessary to enumerate the many evils attending stopped stand-pipes, which in our works have been reduced almost to a minimum by the introduction into stand pipes of a small amount of water continually dropping. The arrangement for its accomplishment is simple, as seen by the accompanying sketch. In order for it to be effective, the pipes must be clean at the commencement, and the water allowed to run so as to produce a very rapid dropping.

II. It adds much to the appearance of a bench of retorts if the lids are free from tar due to the removal of the tarry matter which has collected in the mouthpieces. This may be accomplished by laying two iron bars across the top of mouthpieces, upon which rests a portable pan into which the pitchy matter may be raked before coke is drawn.

III. Wrinkle No. 3 is an iron coke chute wagon into which the coke from bottom retort may be drawn, and from it pushed into the furnace. It is made to extend, when in position, the width of the bench and out from bench about 4 feet. It slants toward the nose, which fits into furnace block, making it a very easy matter to introduce hot coke direct from retorts into furnace. The bed is mounted upon three wheels, and by proper adjusting may be raised or lowered so as to meet the requirements of opening in furnace block. Aside from its usefulness and convenience it enables the floor in front of bench to be made level instead of slanting. The bottom retorts need not be over 16 or 18 inches above floor level, which will put top retorts no higher than 5 feet 6 inches. This wagon can be made by any sheet iron worker.

IV. Wrinkle No. 4 is a sheet iron tongue made to fit on mouthpiece of retort previous to drawing of coke, and serves to prevent the coke from falling on the lower mouthpieces and scattering on the floor. The lower retorts being so low, no wagon that could be dumped could be made to catch all the coke. The tongue delivers coke out into wagon. It is an easy matter to put it on mouthpiece after lid is opened.

The four wrinkles described are illustrated in Plate I.

J. W. DUNBAR.

STACK VALVE FOR BENCH CHIMNEYS.

V. A considerable cooling effect is made on benches during the time their furnaces are being filled or clinkered, by the cold air rushing through the heated passages and flues and out the chimneys. To prevent this the "stack valve," shown in the sketch on Plate II., was arranged. The "valve" is simply a plate of ¼-inch sheet iron, for although a firebrick tile had been thought of, it was decided to use the lighter cover as being equally safe, because when down there would be no current past it, and it would be away from the heat when not in use.

Two plates are used for each bench, riveted to pieces of iron, which are attached to a piece of ¾ inch pipe by set screws. One plate is set opposite each uptake flue. The lever and weight may be fastened at any point on the bar, so that it is easy to place them below a roof truss and use that for holding the pulleys. A long lever may be used instead of the pulleys, if wanted.

The stack valve is made so as to stay open of itself, but can be kept closed by hooking the wire cord below or hanging a weight on the lower end.

ARTHUR FINNEGAN.

ADMISSION OF AIR FOR REVIVING IRON OXIDE.

VI. This wrinkle, illustrated in Plate II., is in use no doubt among many of you, but not by all. It serves to illustrate how easy and simple it is to introduce the required amount of air into gas (about 1½ per cent.) to assist in its purification. By its use the labor in changing purifiers is reduced with us about 90 per cent. We change but one box where 10 were necessary before the introduction of air, the time between changes being about 10 months instead of about 5 weeks. The purification of gas in the former case is near 20,000,000 cubic feet, in the latter

about 2,000,000. Three boxes, 12 × 12 feet, are in use, and in each box there are 200 bushels of iron sponge. When changes have been made, back pressure and not foul oxide has been the cause; back pressure being due to caking of oxide in bottom of box, due to the absence of moisture. By introducing the exhaust steam from exhauster engine into inlet of first purifier, an amount of back pressure is prevented. A dry meter to register the amount of air introduced into gas should not be used, as the diaphragms soon dry and harden, rendering the meter useless; therefore a wet meter is necessary. An ordinary meter cock connection is attached to the pipe which enters at inlet to exhauster, and connected to outlet of meter; and as exhausters are usually run at a vacuum, there will be no difficulty in introducing a sufficient amount of air, which when excessive can be regulated by the stop cock on meter connection. The introduction of 1½ or 2 per cent. of air produces, so far as can be ascertained, no diminution in the candle power of gas.

J. W. DUNBAR.

USING A DRY METER, ADMITTING AIR FOR REVIVIFICATION.

VII. It has usually been the experience of those who have practiced admitting air at the exhauster inlet to ensure a partial revival of their oxide of iron within the purifiers, that a dry meter could not be used for measuring the percentage admitted, owing to the rapid drying of the leather diaphragms. This was also our opinion, confirmed by several successive instances wherein the anatomist of the meter shop had rendered the diagnosis of "cracked leathers." An old 3 × 3 foot wet meter which had served in proving the station meters was then pressed into service for measuring our nitrogenated oxygen, and our difficulty was for the time at an end. After some months, however, the drum of this instrument was found rusted badly, necessitating renewal, and a dry meter was reinstalled until a new drum could be obtained.

Profiting by our former experience and the bills for 200 light leathers, we tried this method of supplying the moisture demanded by the air. The inlet pipe to the meter, instead of reaching to the outer air, was turned down to within about an inch of the surface of some water contained in a galvanized vessel placed beside the meter, about 4x18 inches and 12 inches deep, into which passed a ½-inch steam coil, open at the lower end. A very small opening on the valve controlling this coil was sufficient to cause vapor to rise from the surface of the water, and any additional condensation was led off by an overflow. A cover loosely laid over the galvanized vessel, but open beneath the meter inlet pipe, ensured the proper direction of the vapor, and kept dust and other undesirable particles from the water.

The records of the meter manufacturer will show our purchase of the new drum referred to, in November, 1893, but we have not yet used it. The Glover meter set when the drum failed, in October, 1893, is still in use untouched, and the problem of using a dry meter for this purpose seems effectively solved.

GEORGE T. THOMPSON.

SIGNALING EXCESSIVE VACUUM AT THE EXHAUSTER.

VIII. Materials required:

Two cans (old fruit cans will suffice), one open at top, the other closed.

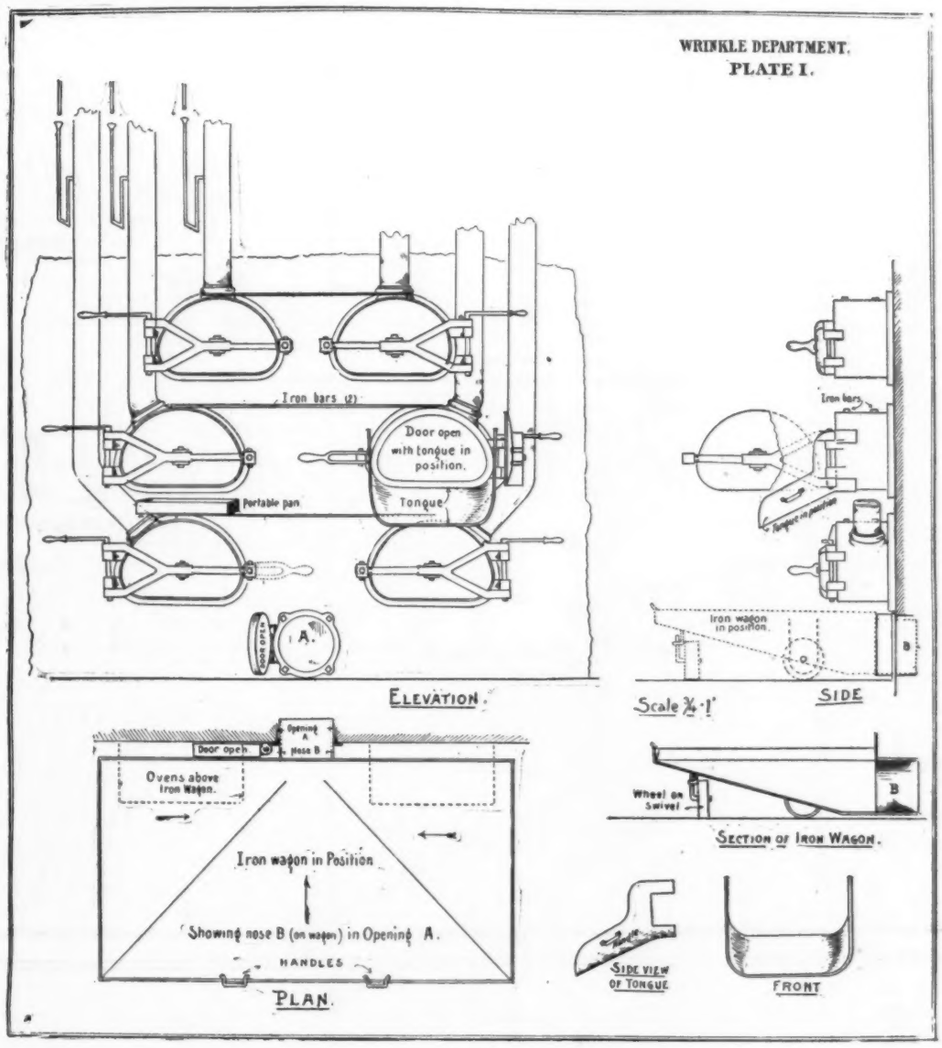
Two ½ x 6 inch nipples, threaded on both ends.

Two ½ x 2 inch nipples, threaded on one end.

One ½ inch nipple, without threads.

Two ½-inch crosses, one ½ inch tee, five ½ inch plugs.

One electric bell outfit.



Solder a ½ x 2 inch nipple into the bottom of each can, and the ½-inch nipple into the top of the closed can. Fit the other nipples, crosses, etc., as shown in the sketch. Drill a hole through the square head of the plug in the tee, and balance the apparatus on a pin supported by a bracket, as shown in the drawing, Plate III.

An explanation of the working is almost superfluous. By means of the rider *C*, made from wire and lead, the arrangement is set at the maximum vacuum desired. Should this be exceeded, water will be drawn from can *B* to can *A* in sufficient quantity to depress the push-button *D* and ring the electric bell, which may be placed in any part of the works. *E* is a wire clamp which prevents the cans from being overturned should back pressure from any cause ensue.

It will be at once evident that such an arrangement may be used to signal pressure as well as vacuum.

JAMES FERRIER.

SAFETY ARRANGEMENT FOR SEALS.

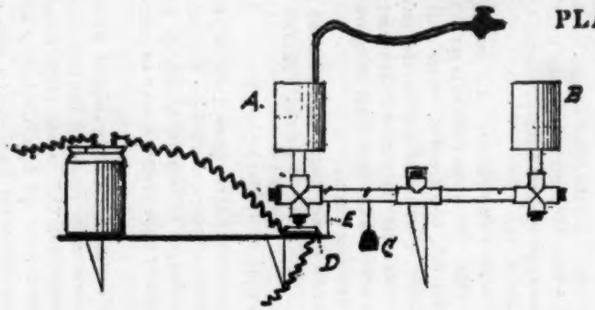
IX. The sketch (see Plate IV.) illustrates an arrangement whereby the use of open seal pots in connection with scrubbers, condensers and other gas apparatus, and consequently the danger of explosions due to gas blowing from seals in case of stoppages or high pressure, may be entirely avoided.

The tar and liquor condensed from the gas are simply trapped under the bye-pass valves of the various apparatus by means of the trap pipes *A A*, and flow along the main gas conducting pipe to one large closed seal pot *B*, opening from which are a blow off pipe *C*, leading out doors, and an overflow pipe *D*, for the condensed liquids. In case of high pressure or stoppages, gas can escape only out doors through the vent pipe *C*.

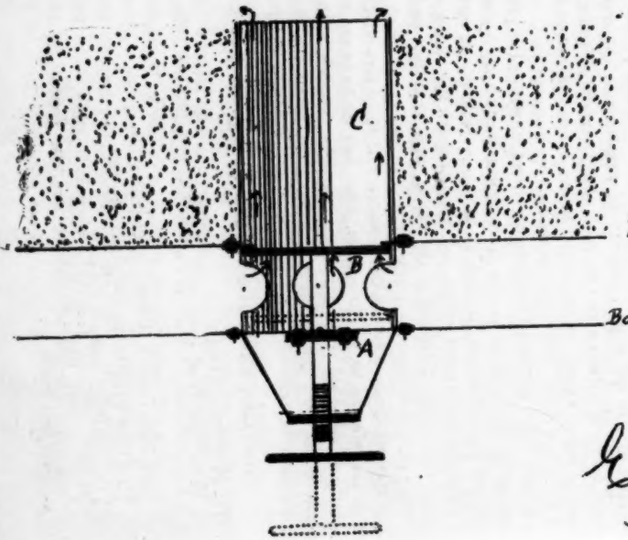
If the main gas conducting pipe should not be level or grade throughout toward the seal pot *B*, drip pipes may be run directly from the low points to the seal pot.

IRVIN BUTTERWORTH.

WRINKLE DEPARTMENT.
PLATE III.

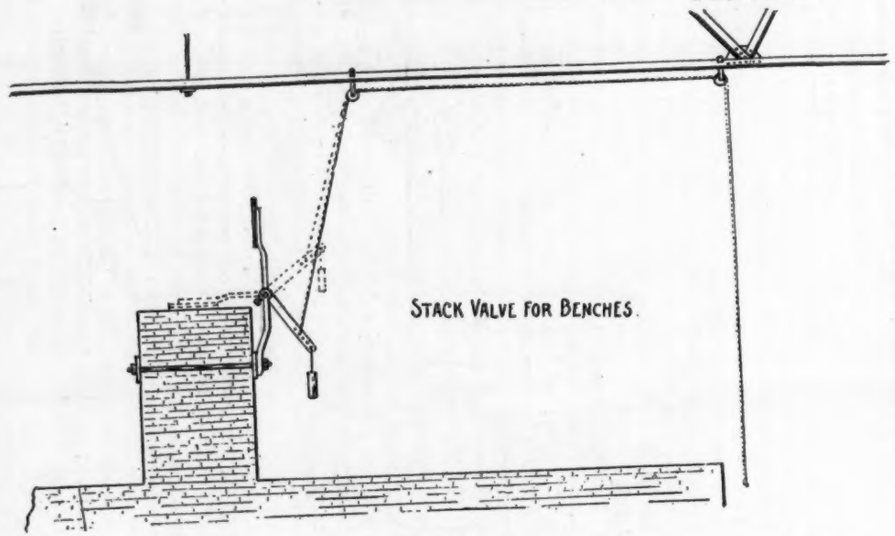


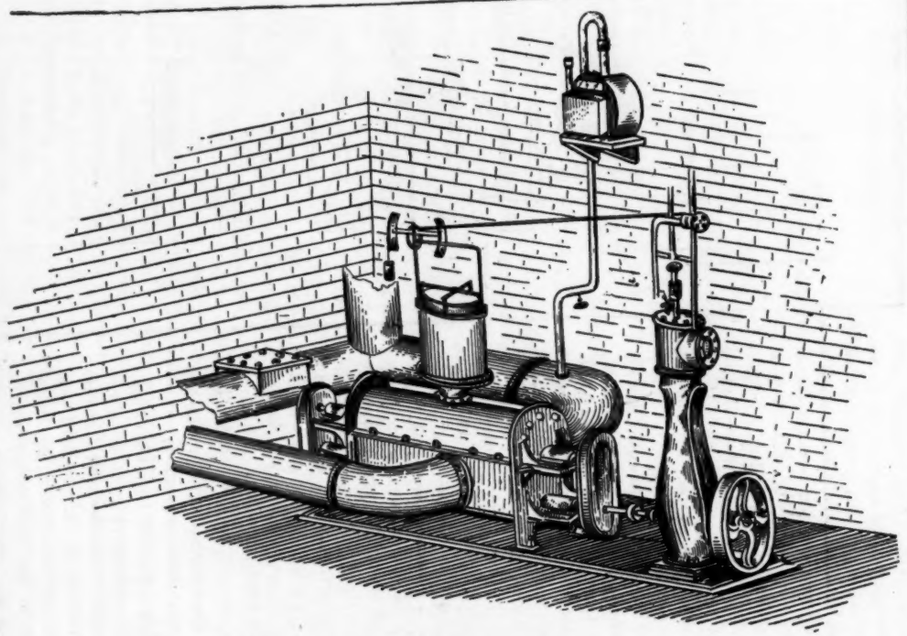
James Ferrier



G. H. Jenkins

WRINKLE DEPARTMENT.
PLATE II.





SKETCH OF EXHAUSTER.

By-Passing the Lower Tray of a Purifier.

X. Experience has shown that in purifying with oxide a purifier has often to be changed on account of back pressure, long before its purifying capacity has been exhausted. This back pressure is caused by the hardening of the oxide in the lower tray.

The arrangement shown in the sketch, on Plate III., has for its object the prolonging of the life of a purifier by bye-passing the lower tray, without the necessity of raising the cover. It consists, mainly, of a valve, the stem of which works through a stuffing box *A* on the bottom of the purifier, and the disc of which works in a flange pipe extending through the oxide in the lower tray. The flange pipe should be of the same dimensions as the connections of the purifiers, and it consists of two pieces, *B* and *C*. The lower piece *B* must be cast specially, as it will be seen from the sketch that the flange at one end extends into the interior of the pipe, and forms the valve seat. For the upper piece, *C*, a nipple of ordinary flange pipe may be used. In piece *B*, holes are drilled for the passage of the gas, the size of these holes being governed by the size of the pipe.

The valve is represented closed, the dotted lines showing the position of the valve, and the arrows the course of the gas when the valve is open. E. H. Jenkins.

Filter for Tar Well Overflow.

XI. All the tar, oil and water from the overflow of the tar well enters this filter through the inlet, to the bottom, and then passes up, filtering through the breeze, which takes out all the lighter oils and tar, leaving nothing but clear water to run out the overflow. A pump is inserted through the inlet pipe, by which the tar at the bottom can be pumped out. This filter not only saves the tar, but avoids the nuisance of its running into the main sewer, or open ditch as the case may be. The device is illustrated in Plate V. C. M. Keller.

Using Bench Waste Gases Under a Boiler.

XII. In the use of this apparatus the waste heat of the retorts is brought under the boilers by connecting the two flues at the top of the bench and carrying the connection down the side of the boiler near the front. By bringing it down the side, as shown in the plans on Plate V., it does not interfere with the firing of the boiler in the least. No dampers are necessary whatever, except the dampers that are always used in the bench flues, and to regulate the draft. If the boiler is to be cleaned or the heat not wanted under it, you only remove the slabs on top of bench flues and allow the heat to escape in the old way.

C. M. Keller.

Basket for Melting Out Lead Joints.

XIII. Having occasion to remove some 200 feet of 12-inch main from its position on supports overhead in the works yard, the device of which a description follows was adopted to avoid the labor otherwise necessary in cutting out the lead joints. The "basket" was formed from three pieces of old sheet iron; two of them, the end or front pieces, were alike, U-shaped, the inner semicircle fitting the outside of the main and the outer one being some 10 inches greater in diameter; the third was rectangular, about 18 inches wide, and bent to fit the outer edge of the front pieces, to which it was attached by "knees" of light iron, secured by rivets and stove bolts. A number of 1 inch holes were roughly punched in the bottom for draft, and handles were attached at the side, through which an iron rod or short piece of pipe might be passed across the main to hold the basket in place when in use. The accompanying sketch on Plate IV. will make this description clearer.

It was intended to employ hot coke in "burning out" the joints, but owing to the small body of fuel and its consequent rapid cooling, this was not found satisfactory. Using dry wood, however, the lead was quickly melted. Wherever possible the lengths were drawn apart with screwjacks, but on most of the joints this basket was used, and proved very convenient and satisfactory. Geo. T. Thompson.

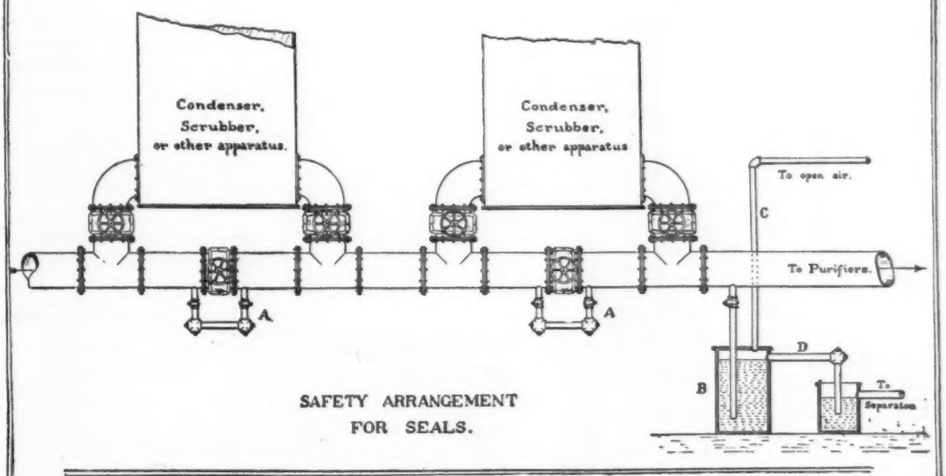
Analysis of Gas by Inspection.

XIV. For this apparatus are required three accurate meters registering tenths or preferably hundredths of a foot, a miniature purifier for oxide—which can be made by any tinsmith—and a tower scrubber made of a glass tube 2 or 3 feet long and 2 or more inches in diameter, which is filled with large coke breeze. They should be connected as follows: First, meter No. 1; second, purifier; third, meter No. 2; fourth, scrubber; fifth, meter No. 3. Inlet and outlet valves or cocks and by-passes should be provided for all parts of the set.

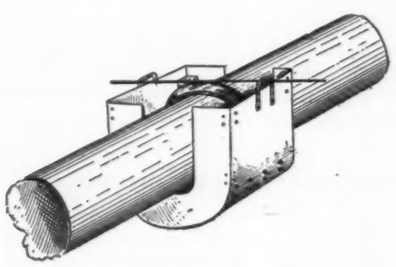
The inlet of the set may be permanently connected to the outlet of the condensers, and its outlet to the inlet of the exhauster, thus securing a steady flow of gas.

The purifier may be filled with oxide of iron, manganese, or any other purifying material which does not absorb CO_2; while the scrubber

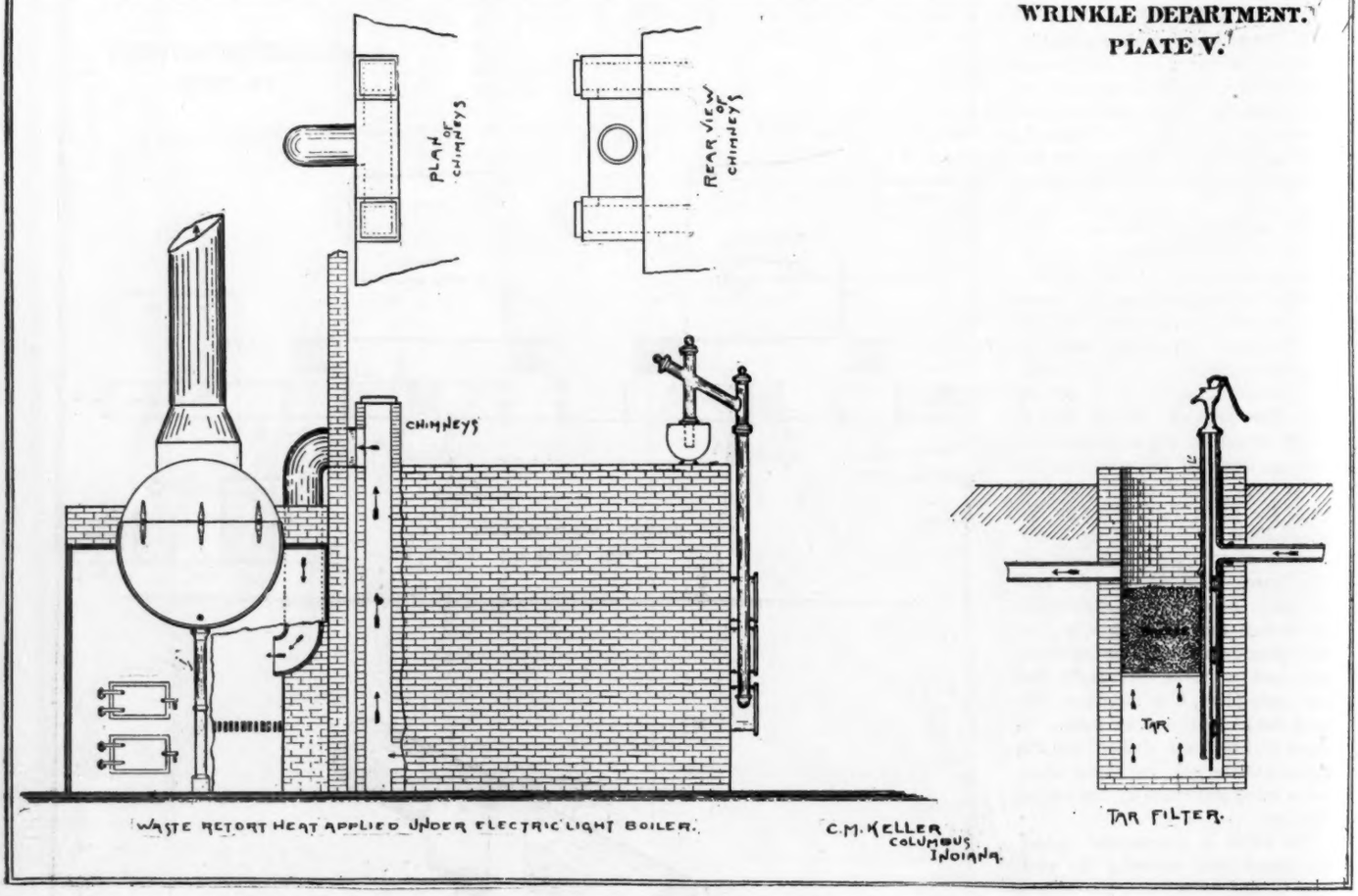
WRINKLE DEPARTMENT
PLATE IV.



SAFETY ARRANGEMENT FOR SEALS.



WRINKLE DEPARTMENT.
PLATE V.

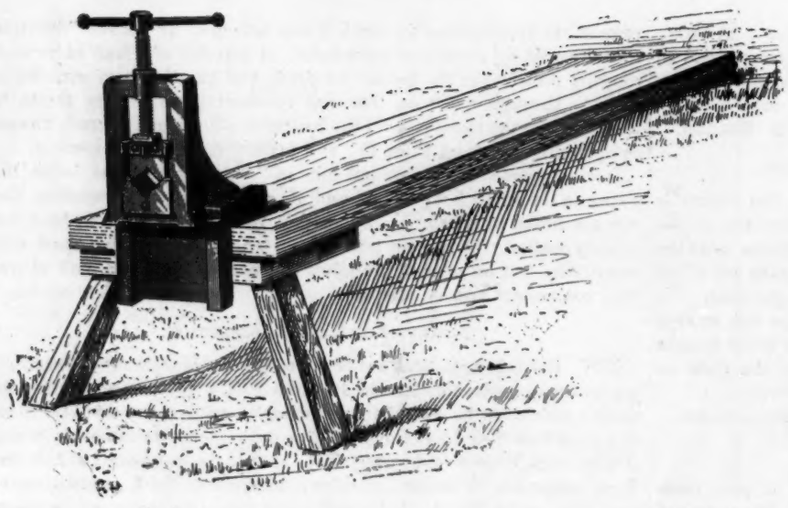


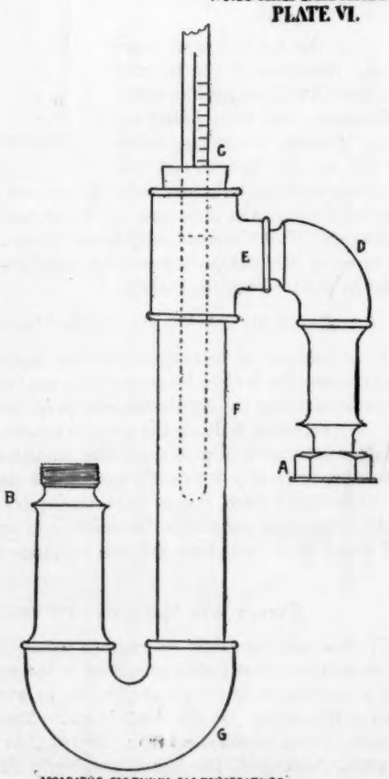
WASTE RETORT HEAT APPLIED UNDER ELECTRIC LIGHT BOILER.

C. M. KELLER
COLUMBUS
INDIANA.

TAR FILTER.

WRINKLE DEPARTMENT
PLATE VI.





APPARATUS FOR TAKING GAS TEMPERATURE AT CONSUMER'S METER

should be supplied from an overhead feed with a strong solution of caustic potash, which trickles down the coke, coming in contact with the gas and extracting its CO_2.

The action of the apparatus is easily comprehended. The foul gas passes through meter No. 1 where it is registered, thence to the oxide purifier where the H_2S is extracted, from which it passes through meter No 2 and is again registered. The difference between the two readings will show the proportion of H_2S in the gas passed. In like manner, after passing through the scrubber and parting with its CO_2, it is again registered by meter No. 3. The last reading subtracted from that of meter No. 2 indicates the CO_2.

In an experimental apparatus of this description erected at Station B, of the Laclede Gas Light Company, the meters employed are dry portable test meters, rated about 5-light. It is obvious, however, that wet meters would be preferable, as being more easily regulated and less liable to error. Before and after each test the purifier and scrubber should be by-passed and a quantity of gas run through the meters under the same conditions, to test their comparative accuracy. O. O. THWING.

PORTABLE PIPE VISE BENCH.

XV. The sketch on Plate VI. shows a form of portable bench for a pipe vise, which has been used to good advantage in street work.

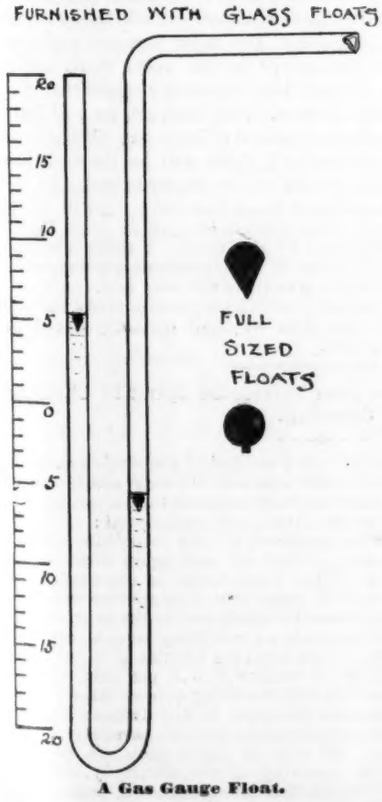
The vise is bolted upon a light plank, supported at one end on two removable legs, the other end resting on the ground. The bolts pass through the board which forms the bench top, and are secured by nuts beneath a smaller plank of oak or other hard wood. B. E. CHOLLAR.

TAKING GAS TEMPERATURES AT THE CONSUMER'S METER.

XVI. As is shown in the drawing on Plate VI., this apparatus is made up of a street elbow *D*, a tee *E*, a short piece of pipe *F*, and the return bend *G*. To these are connected by means of short pieces of lead pipe male and female meter unions. The thermometer is inserted by means of a perforated rubber stopper *C*. This may be easily and quickly connected to the outlet of a meter without changes in the connections, and will give accurate readings of the temperature of the gas passing through it. H. W. DOUGLAS.

A GAS GAUGE FLOAT.

XVII. There was recently brought to my notice a device called the "Automatic Safety Signal for Steam Boilers." This great title referred to a very small glass bulb floating in the water gauge, the bulb, being colored red or blue, clearly indicated the level of the water within the boiler. An immediate extension of the usefulness of the idea was visible in its application to the gas gauges which abound in all gas works. Water colored with aniline and similar extracts soon soils or destroys gauge glasses, but the character of the glass float entitles it to be called clear, blue, and everlasting. When the old time cork floats have been replaced with these bright blue or red bulbs much time and anxiety are saved to the gas makers, whose eyes cannot quickly discern the ever changing water level. In water gas manufacture they are especially useful, as pressures can be read almost instantaneously.

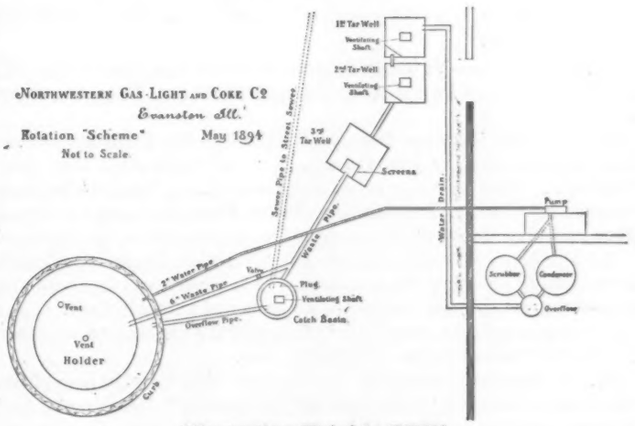


A Gas Gauge Float.

The device of a colored glass float to indicate the water level in a steam boiler originated, in so far as I know, with Mr. E. W. Spear, of Boston. I do not know who first applied the float to gas pressure gauges, but it is easy to see its usefulness, especially where the gauge glasses are soiled by the deposition of tar or dust, or where the water level is obscured through lack of light, or by reason of distance. I learn that an effort either has been made or is being made to cover by patent the general use of the glass float, but no patent has yet been issued. W. E. MCKAY.

NOTES ON THE DISPOSAL OF THE WASH-WATER FROM WATER GAS PLANTS.

XVIII. We have had the same trouble which all gas works experience that have no flowing stream nor even a swamp in which to dump their refuse. When the first water gas plant was installed in Evanston, in 1888, all the wash waters, accompanied by tar, wash oil or naphtha,



Illustrating Wrinkle XVIII.

condensation, etc., were allowed to run freely into one of the common sewers of the town, and thence to Lake Michigan. It was not long before complaints of the odor and the filling up of the sewer came pouring in. We then sunk two 6 ft.x6 ft. basins, trapped top and bottom, connecting with two catch basins, to our private sewer, which ran into a large public sewer. As a result of this and some minor improvements, together with care in not allowing the basins to fill up with tar, and in frequent skimming off of the oily matters on top of the water in the basins, all tarry residues were kept entirely out of the public sewers. But this did not suffice. Complaints about the odor still came. So we put in another large basin, placed ventilating shafts in all these reservoirs, and connected a fan so that it drew its air from the public sewer *against* the running stream in our private sewer. These devices appeared to help the matter somewhat, but just at this time (October, 1893) our water rate, which had been a special one of $100 per annum, was cancelled, meters located in the works, and the rate placed at 10 cents per 1,000 gallons. We used the water for condensing, cooling and washing just as freely, and our water bill immediately jumped to $80 a month. This alarmed us, so we stinted the supply, and then the music began. Complaints of property being ruined, unfit for sale or residence, came so frequently that the city authorities took hold once more. Many plans for the elimination of the odor from the water were suggested at a joint meeting of the City Council Sewer Committee, Commissioner of Public Works, Board of Health and ourselves. These plans were to try precipitation, deodorization, volatilization and filtration. None of these possessed even a fraction of feasibility, save possibly the latter, which we intended to try if our present practice proved a failure. We finally evolved a scheme of prevention rather than cure, which we call "Rotation," for lack of a better term.

Having built a new 150,000 feet holder, in 1893, for night consumption, and having our second holder of 60,000 feet for the day time, we had still the original 20,000 feet holder, which was not now used, and, being located conveniently near the works, was available for an experiment. We dropped the holder to the bottom of the pit, bye passed the last catch basin in the yard, and ran a 6 inch main through the masonry wall and shell of the holder, thus permitting the waste waters to flow into the holder; any odors can pass away through ventilating pipes. Next we connected a 2-inch suction pipe from near the bottom of the outside of the pit to the pump, and thence to the condenser and scrubber as usual. By this plan as outlined we use the water over and over again, hence the term "rotation." We have been operating as described only one month, but the plan is a success thus far, and we can see no reason for a failure in the future. The pit being 40 feet in diameter, and having 10 feet of water up to the overflow, will hold about 100,000 gallons, which being deep in the ground is bound to be cool summer and winter. The suction pipe is 6 feet below the surface of the wa-

ter. We find the condenser is kept cold with a slow but continuous motion of the pump, and our water bill promises to be below $5 per month. We still have use of the sewer to flush the holder, which may be once or twice a year, but otherwise no wash waters leave the works, consequently our burden of complaints, in one direction at least, has been dropped. The plan is very simple, but eminently satisfactory. A rough sketch, not drawn to scale, to illustrate our method accompanies this paper. W. Lee Brown.

THE QUESTION BOX.

The President—That concludes our list of papers, and we will take up the few questions remaining. The first is:

"Is there a market for retort carbons, and what price does this carbon bring?"

Mr. Butterworth—Virtually the same question was asked at the Ohio meeting, and was followed by a very painful silence. There was no one to answer.

Mr. Keller—I just came from the Standard Carbon Company's works. I have, I suppose, 5 or 6 tons to sell. I asked them what they would give for it. They said they could allow scarcely anything, owing to the distance I was away. I asked them what they would give for it delivered. They said they would allow me about $10 per ton f. o. b. in Cleveland.

The President—We will take up the "Wrinkle Department" again before asking the other two questions. This department has been very carefully prepared, and it contains a number of valuable ideas. If anyone desires to ask any questions about any of the suggestions, or if there is to be any discussion, we will have it now.

Mr. Thompson—There is one feature about this Wrinkle Department which might entitle it to the name of "Columbian" Department, for it contains contributions from Columbus, Ohio, Columbus, Georgia, and Columbus, Indiana.

Mr. Butterworth—There is one Wrinkle which you can see between the lines of one of Mr. Thompson's descriptions, and which I think is rather a valuable one. If a consumer asks me hereafter whether I introduce any air into my gas, I will say, "No; but I do take in a little nitrogenated oxygen."

Mr. Ferrier—I would ask Mr. Dunbar if the regulation of the amount of air passing is done wholly by hand?

Mr. Dunbar—Yes.

Mr. Ferrier—Do you know any automatic arrangement which will allow of the admission of air according to the station meter?

Mr. Dunbar—No.

Mr. Thompson—There are several such arrangements proposed. The only one I have ever seen operating was one in which one of the dials of the station meter had its shaft extended with a chain gearing to connect with a small wet meter which was used as a pump. That was at the Ramsgate works, in England, and was used in connection with Valon's oxygen process, in which connection it was especially necessary. It has been proposed, in addition to that, to use the exhauster instead of the station meter as a means of proportioning the flow of air. In our own case we use a dry meter as described, and run the exhauster at a constant vacuum. We change the inlet of the meter (the opening on the valve) only when we alter the rate of make of gas. I might add that the meter readings are taken every hour, so that there is no possibility of any lengthy period passing without the ratio of air to make being very carefully regulated.

Mr. Ferrier—It would not be suitable for smaller gas works?

Mr. Thompson—Hardly. In the case of small gas works I think that readings every 12 hours could be taken without difficulty, and would probably prove sufficient.

The President—We will resume the questions:

"Can any member give information in regard to the Peebles' process of making gas from coal tar?" No response.

"What would be the additional expense of enriching water gas from 20 to 25 candles?" No response.

Committee of Arrangements for '95.

The President—I am requested by Mr. Baxter to announce the following Committee of Arrangements for the next meeting: John Young, Robert Young, John H. McElroy, F. L. Slocum, James H. Gardiner, Jr. I should take pleasure in introducing to you and turning over the gavel and interests of the Association to the incoming President, but it happens that he is not here. Is there any further business before the Association?

Mr. Butterworth—As Chairman of the Committee on Final Resolutions I have to present the following:

FINAL RESOLUTIONS.

Whereas, The 17th Annual Meeting of the Western Gas Association is about to adjourn after a most successful and profitable session; and

Whereas, We believe that public and formal acknowledgment should be made by us of our obligations to those who have contributed to this success; therefore,

Resolved, That we hereby express our appreciation and thanks for the efforts that have been so freely and efficiently given in behalf of the success of this meeting, and the pleasure of our members, by the Cleveland Gas Companies and by their officers, individually; by the exhibitors of gas apparatus, who have provided for us a most notable and interesting exhibition of their appliances; by the local manufacturing companies, who have co-operated with the Gas Companies in providing social entertainment for our enjoyment; by the Committee of Arrangements; by the Cleveland Press; and last, but not least, by the officers of the Association, especially the President and retiring Secretary, the latter having closed with this meeting a long term of efficient service in behalf of the Association.

Irvin Butterworth,
B. A. Ward,
W. H. Odiorne,
} Committee.

On motion of Mr. Gwynn the report was received and adopted.

The President—Before we separate I wish to say on behalf of the officers of this meeting that we thank you all for your kind attention and for your very efficient help in carrying the meeting through; and while this has been a rather lengthy session this morning, and continued under some difficulties, we feel that success has attended it to its close. Is there anything further before the Association?

An Invitation.

Mr. Harbison—Having been for quite a term of years engaged in the gas industry, and devoted perhaps as many hours a day to it as the average gas man does or ought to, to say the least, I have felt for years that the gas manager has not taken proper care of himself and of his clerks; that the office accommodations of gas companies generally throughout the country are not at all what they ought to be. I want to say that in our case, at Hartford, we have made a new departure. The reason, or one of the reasons, I was absent from your meeting a year ago was because we were just starting the erection of a new office building. It is now nearly completed. During the many years I have been privileged to come to your Western meetings I have been received in the most cordial and hospitable manner by every member of the Association—a reception which I warmly appreciated. I do not very often see members of the Western Association in the city of Hartford—much to my regret and greatly to their loss. (Laughter.) But there was not anything specially attractive even in the Manager of the gas works there, nor in the works themselves, and so I could not reasonably expect that they would inconvenience themselves to come. But now, sir, we will have an office that is worth journeying a thousand miles to see. Within the next 30 days we expect to dedicate what I think will be the finest gas office in the United States; and I would be very happy to welcome any and all the members of this Association to see that office. I will try to be there if you will let me know when you are coming, in order that I may have the pleasure of taking you by the hand. I think it will be worth a little effort on your part to see it. Our consumers always want the very best, and we have aimed to give them the very best.

The President—We thank you for your kind invitation, and I am sure when any of us get anywhere near you we shall certainly accept it. This meeting now stands adjourned.

Means of Preventing Fires from Petroleum Spirit in Chemical Cleaning.

C. F. Goehrins describes the following method of preventing accumulation of electricity in benzine in cold weather. It may sometimes be applied when benzine is to be used for other purposes than cleaning, and when the small quantity of soap required is not detrimental:

"When dried wool and silk are immersed in pure petroleum spirit in the neighborhood of an electroscope, lifted out and again immersed, a wide divergence of the leaves of the electroscope is observed. The amount of electricity may be even so great that it cannot be measured by the electroscope. If the experiment is conducted in the dark, electric sparks and flashes of light, accompanied by crackling sounds, are seen and heard, which may readily increase until the benzine is ignited. The method of prevention is to add to the benzine .2 to .3 per cent. of soap soluble in benzine, when the sparks and crackling at once cease and all danger is avoided. It is well known that pure, freshly distilled benzine, in the cold, dry days of winter, is liable to take fire spontaneously, owing to the production of electricity. As soon as the atmosphere becomes warm or moist the conditions for carrying off the electricity, or for its total prevention, are secured. In the first case mentioned, possibly the soluble soap provides the necessary moisture, which, by means of the soap, is dissolved in the benzine, water being otherwise non-miscible with benzine."

[Official Report.]

SECOND ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

Held at Sacramento, Cal., May 15 and 16, 1894.

First Day—Morning Session.

The Association was called to order at 10 o'clock, A. M., by the President, Mr. J. B. Crockett.

ROLL CALL.

On the roll being called, the following members were found to be present:

J. B. Crockett, San Francisco (Cal.) Gas Light Company; F. H. Eichbaum, Pacific Gas Improvement Co., San Francisco, Cal.; M. C. Osborn, Virginia City (Nev.) Gas Co.; C. W. Quilty, San Jose (Cal.) Light and Power Co.; O. M. Gregory, San Jose (Cal.) Light and Power Co.; John Clements, Red Bluff (Cal.) Gas and Electric Light Co.; J. E. Gannon, Gas Inspector, San Francisco, Cal.; J. W. Thomas, Vallejo (Cal.) Gas Co.; B. U. Steinman, Capital Gas Co., Sacramento, Cal.; J. C. Pierson, Capital Gas Co., Sacramento, Cal.; Henry E. Adams, Stockton (Cal.) Gas Light and Heat Co.; N. Wylie, Carson City (Nev.) Coal Gas Co.; T. R. Parker, Napa City (Cal.) Gas Light and Heating Co.; Chas. F. Adams, Portland (Ore.) Gas Co.; Ph. Meyer, Livermore (Cal.) Gas Co.; John A. Britton, Oakland (Cal.) Gas Light and Heat Co.; Van L. Eastland, Oakland (Cal.) Gas Light and Heat Co.; Edward C. Jones, San Francisco Gas Light Co.; W. F. Boardman, San Francisco, Cal.; S. B. Cushing, San Rafael (Cal.) Gas and Electric Light Co.; C. Froelich, Agent R. D. Wood Pipe Co., San Francisco; B. A. Knight, Agent McNeal Pipe Co., San Francisco; E. F. Sherman, East Portland (Ore.) Gas Co.; D. Decker, Fresno (Cal.) Gas and Electric Light Co.; V. Stow, of Thomas Day & Co., San Francisco; Chas. Dickey, Maryland Meter Co., Baltimore, Md.; Jas. McNeil, Santa Cruz (Cal.) Gas Co.; W. M. DuVal, Agent Maryland Meter Co., San Francisco; H. R. Shade, Virginia City (Nev.) Gas Co.

Upon suggestion of the President, and on motion, the reading of the minutes of the last session was dispensed with, as same had been fully printed in the gas journal.

Election of New Members.

The President stated that, unless objection was made, the order of business as printed would be changed, so as to pass immediately to the election of new members to permit of their participation in all the business of the meeting. The Secretary read the names of applicants for membership which had been passed upon favorably by the Directors, as follows:

C. Froelich, Agent R. D. Wood Pipe Co., San Francisco; B. A. Knight, Agent McNeal Pipe Co., San Francisco; E. F. Sherman, Supt. E. Portland (Ore.) Gas Co.; J. B. Lacy, Supt. Phœnix (Arizona) Gas Co.; J. Kullman, Sec. Benicia (Cal.) Gas Co.; W. J. Landers, Pres. San Leandro (Cal.) Gas Co.; W. B. Cline, Pres. Los Angeles (Cal.) Lighting Co.; A. B. Williams, Sec. Santa Barbara (Cal.) Gas Co.; D. Decker, Supt. Fresno (Cal.) Gas and Electric Co.; F. J. Symmes, Pres. Thos. Day & Co., San Francisco, Cal.; V. Stow, Sec. Thos. Day & Co., San Francisco, Cal.; R. P. Greer, Maner Pacific Ammonia and Chemical Works, San Francisco, Cal.; James Moffatt, Sec. Salt Lake and Ogden (Utah) Gas and Electric Light Co.; Chas. Dickey, Maryland Meter Co., Baltimore, Md.; Chas. R. Allen, San Francisco, Cal.; Jas. McNeil, Santa Cruz. (Cal.) Gas Co.; A. C. Humphreys, Drexel Building, Philadelphia; W. M. DuVal, Agent Maryland Meter Co., San Francisco, Cal.; E. C. Randall, San Jose (Cal.) Light and Power Co.; H. R. Shade, Virginia City (Nev.) Gas Co.

Mr. Jones, of San Francisco, moved that the Secretary be empowered to cast the ballot in favor of the gentlemen whose names were just read, which motion was adopted and carried into effect.

Report of Secretary and Treasurer.

The Secretary submitted the following report of receipts and disbursements during the past year, which report had been approved by the Board of Directors, and, on motion, the same was adopted.

The Secretary presented his report showing an enrollment of 76 members, including 20 applications approved by Directors, 37 gas companies being represented, with 54 members from California, 3 from Nevada, 2 from Utah, 6 from Oregon, 4 from Washington, 1 from Arizona and 6 from Eastern States.

The financial statement of the Treasurer as presented, showed a total of—

Receipts from dues and initiatory fees	$505 00
Disbursements	136 40
Balance cash on hand	$368 60

Probable receipts during year, $460, from dues and initiation; estimated expense, $360; leaving cash available for future meetings, $468.60.

This report, with accompanying vouchers, was approved by Finance Committee of Directors, and on motion it was adopted and ordered on file.

PRESIDENT'S ADDRESS.

The President then read his annual address, as follows—

Members of the Pacific Coast Gas Association: It is with great pleasure that I greet so many of the members of the Pacific Coast Gas Association at this, our first annual meeting since the organization of the Society. It shows that the work so recently commenced has borne good fruits. When the idea of an Association of this sort was first broached, I must confess I was very doubtful as to its ultimate success; but at our last meeting, when I saw the earnest way in which each member took hold of the different propositions advanced, I made up my mind that we were all there for the purpose of learning, each by the experience of the other, and I was particularly pleased to see that the members were not afraid to discuss any proposition brought forward. Upon this depends the benefits of this Association—we must discuss everything with a view to the full understanding of it; therefore, to-day we will submit for your discussion some papers which should be of more than ordinary interest. Mr. Britton will read a paper on the "Proper Books of Record" of a gas company. This is something of vital importance to any company, large or small, as every manager should keep exact daily records of all that happens at his works.

Mr. Osborne will read a paper on "Small Things around a Small Works." Yet how often do the small gas works give us valuable data which the larger works overlook, and the larger gas works should then write a paper on small things around large gas works. Mr. Parker, of Napa, will tell us what he does at his works, and every man can best detail his own experiences. Mr. Quilty, of San Jose, will deal with one of the most interesting and yet difficult subjects, "The Relations of Lighting Companies to the Public;" and last of all Mr. E. C. Jones will read a paper on "Purification," a subject that he is fully competent to handle. Thus you will see you will have many interesting subjects to discuss.

During the past year the gas business, in common with all other industries, has felt more or less the effects of hard times, but I think we have felt it less than most people. While it is true that our business did not increase as much as it should have done, still it did increase in spite of the hard times and the active opposition of the electric light.

The electric light, while an active and aggressive competitor, has not yet been cheapened sufficiently on this Coast to make it a very dangerous competitor to gas, where it can be sold at a reasonable price; still the advances made in cheapening the electric light make it the duty of every gas man to watch it carefully, but above all he must put his own house in order to meet such competition. In former days the gas business was so successful that we neglected many of the details of the works, and were satisfied if we could do as well as our neighbor, without thinking for ourselves to see whether or not we could not do better; but with the advent of the electric light, gas managers realized for the first time that they must, each for himself, do the best he could to cheapen his product and sell his gas at the lowest possible price, commensurate with his duty to his stockholders, and that he must be satisfied with a reasonable profit on his investment. With intelligent management and hard work on the part of the gas manager, he can so conduct his business as not to fear the electric light.

A very important matter has come up since the last meeting of this Association, and that is the proposed change in the duty on foreign coals. While this does not affect all the Companies connected with us, still it affects in a marked degree all the Companies in California.

It is a fact probably unknown to some of you that California alone has paid 80 per cent. of all the duties paid on coals in the United States. We are almost the only State in the Union which has no coal within its own borders, or in some neighboring State sufficiently near to get our supplies from. Therefore it seems hard that we should not only have to get our supplies thousands of miles away and then pay a duty of 75 cents a ton in addition; so the prospect of having the duty reduced to 40 cents per ton will help every Company in this State. While upon the subject of coal it may not come amiss to say that at our last meeting the subject of Japanese coal was discussed more or less, and since that time the San Francisco Gas Light Company, in common with many others, have found it a rather hard coal to handle, owing to the difficulties of

purification; but from experience we have now overcome these difficulties, and I am sure that if the Companies who make coal gas alone will enlarge their purifiers, they will soon save the cost of them by the saving they can make in the use of enrichers. I hope, though, that this matter will be more fully developed when the paper on purification is read.

It is not generally understood or appreciated why the price of coal on this Coast is so high, and when you tell people that the price of coal depends on the state of the wheat crop or the price of wheat, they do not see why this should be so; but when you consider that most of our coal comes from foreign countries in steel ships, and is brought almost as ballast, you will see how it is. The vessel starts from Great Britain with an assorted cargo for Australia; then, to get a return freight, has to come to California for wheat, and as there is nothing for them to bring here but coal, or come in ballast, they bring coal. If we have a large crop of wheat, and the price obtained for it is good, then a great many more vessels come here, freights from Australia go down and coal becomes cheaper. So it is with many other things on this Coast used in our business. I am often asked the question why should gas cost so much more here than in the East, and the answer is easily given; because all kinds of coal cost from 50 to 150 per cent. more; our oil from 100 to 250 per cent. more; our supplies, such as meters, retorts, pipes, etc., have to be brought 3,000 miles at exorbitant freight rates. Taking all these disadvantages into consideration, we certainly are not charging any more in comparison than they do in the East.

Since the organization of this Association we have been asked by a great many managers what they should do to keep down their leakage account. This is a question which concerns us all, but in my opinion every gas manager must first keep an accurate map of all his mains, showing their location in the streets, depth, etc., then systematically examine his mains and services whenever the opportunity offers. We have an arrangement in San Francisco with the Superintendent of Streets, whenever any block is to be torn up for street work of any kind, either for new work or repairs, that he will send us word in advance, so we can overhaul our mains and services; in this way we are able to do a great deal of repair work at small expense.

But one of the most necessary things to do is to keep the consumers' meters in repair and see that they register properly. I can only touch upon most of these points in a paper like this, but would suggest that some member might take this matter up more carefully and write a very valuable paper upon it. Another subject which I am sure some member, such as Mr. Quilty or Mr. Britton, of Oakland, might write upon from experience—there are so many electric roads in their cities—is what is now known as "electrolysis." That is where the electricity attacks cast iron mains of both water and gas companies, rendering them soft and spongy, and often totally destroying the usefulness of the pipe. I do not know of any place on this Coast where it has occurred, but either of these gentlemen might have had some experience which would be most instructive. You will find a most interesting article on this subject, in the AMERICAN GAS LIGHT JOURNAL, of October 30th, 1893.

The continued satisfaction given by gas stoves, and the constantly increasing demand for them, has greatly helped the gas business on this Coast, and it requires very little demonstration on the part of the gas companies to show their superiority over coal. In all large cities there are many houses which are fitted up entirely for the use of gas stoves, and in San Francisco several architects in their specifications call for independent pipes to be run especially for their use. This business is one, though, which must be pushed vigorously and intelligently to be a success. So it is with gas engines. When they were first introduced into this State no one would use them, until we induced one or two of our prominent merchants to try them, with the understanding that we would take them off their hands if they were not satisfied; but now, by energetic pushing, we have had so many demands for them that there are now two factories exclusively engaged in their manufacture.

Some time ago we had brought to our attention a new meter, called the prepayment meter, which works on the principle of the nickel in-the-slot machine. Messrs. W. & B. Cowan, of London, have introduced these meters with great success, and upon their representations we were induced to try some of them, so I ordered about 75. Since their arrival I have tested them very thoroughly in the office, and lately have set a few for consumers, and so far the results have been satisfactory both to the Gas Company and to the consumer. These meters must be set inside the house, and the household should sign an agreement to see that they are properly cared for. We have found that the people who most object to paying a deposit are usually the hardest to collect from; so now when we find a customer like this we set a prepayment meter and compel him to pay for the gas before he uses it, and the strange thing about it is they take to them so kindly.

The method adopted is, where the statements are taken monthly and small amounts of gas are used, collections from meters are made twice a month, but if larger amounts are used the collections are made oftener according to the protection afforded the meter. The statements are taken just the same as from an ordinary meter, the bills written and given to the accountant for examination. Collections when made are credited on account, the collector giving the consumer a receipt for mutual protection.

One of these meters was set for a consumer who had changed his residence and was always behind in his bills. At his own request we set a prepayment meter for him. He had recently failed, compelling us to settle a $30 gas bill for about 30 cents on the dollar. He was well known to be a careless business man. His bill would average about $20 per month. He said when the collector called there on May 8th that he liked the meter immensely, because a fellow never missed a quarter or so, and often threw that much away in some useless way; but now the gas meter was a kind of savings bank, and instead of buying extra cigars he would put a quarter in the meter and get some good from it, and at the same time not feel the payment of his gas bill.

We placed another meter on Sutter street, where the consumer declined to make a deposit and we considered him bad pay. After some persuasion he was induced to try a prepayment meter, and arranged a proper place for it. He later stated that the meter was just what he wanted; he now could not growl about the size of his gas bill, and could gauge it to a nicety. The following extract from an article published in the Liverpool *Mercury* of March 5, 1894, will be interesting in this connection:

'The automatic gas meter apparently enjoys the confidence of the people to an extent never attained by its progenitor, the ordinary registering gas meter, which is almost invariably regarded as a mysterious mechanism for the perversion of the truth. The reading of the dials of an ordinary gas meter is a puzzle to the majority of householder. One of the very first lessons in practical mathematics gleaned in the earliest stage of youthful instruction is the knowledge of pounds, shillings and pence; and the dials of the automatic meter show at a glance the amount put into it in £ s. d. In addition to this, it has the ordinary meter dials, so that even if a consumer does not know how much gas he has paid for, he can see at a glance the amount of money he has paid. Each penny dropped into the meter is recorded, and week by week he can ascertain at a glance how much his gas has, so far, cost him. Of course this arrangement may not be absolutely necessary, but still with most consumers it will, no doubt, find great favor. It would seem, therefore, that the automatic meter performs all that it promises, as it carries on its face the assurance of fair dealing and reliability. The penny dropped into the slot of the automatic meter produces an immediate return, and the amount received in return for the coin can be as accurately checked as it could be were it a pound of bread, a half pound of sugar, or an ounce of tea."

In this country the American Meter Company have lately investigated this meter thoroughly and have commenced the manufacture of them, and in a short time I have no doubt but that they will come into general use. We have one member with us to-day who has shown his zeal in our behalf in more ways than one. I refer to Mr. Kempf, of Salt Lake, who lives at a greater distance from Sacramento than any other member, and we should appreciate that it is no small undertaking to leave his work and come so far. Mr. Kempf will read a paper on "Foes to our Gas Mains and Service Pipes."

In conclusion I thank you all for your attendance at this meeting, and hope you will always continue to take the same interest in this infant Association as you do now.

The President appointed the following committees:

On Next Place of Meeting.—Messrs. T. R. Parker, of Napa; N. Wylie, of Carson, Nev., and John Clements, of Red Bluff.

On Nominations.—Messrs. E. C. Jones, of San Francisco; J. W. Thomas, of Vallejo, and H. E. Adams, of Stockton.

Committee on "Wrinkles" for next meeting.—T. R Parker, of Napa.

Mr. E C. Jones, of San Francisco, then read his paper on

PURIFICATION OF GAS.

No chapter in the history of gas manufacture is more interesting than that of purification. Beginning with the discovery that coal gas contained sulphur compounds which were not consumed during the combustion of the gas, but were discharged into living rooms to the discomfort of the consumer, the art of gas purification became a necessity; so, in 1806, Clegg made the first efforts in this direction by mixing quicklime with the water in the gasholder tank at Halifax.

This, of course, did not insure sufficient contact between the hydrate

of lime and the gas, to accomplish the expected result, but in 1815 Accum, in a treatise on gas light, described a lime machine which embodied the salient points of the Pelouze and Audouin condenser invented many years afterward, and utilized for a purifying agent a cream of lime, which is the most efficacious and economical known form in which lime can be used in gas purification. This form of purification was used in the United States until the '50's, and its use was reluctantly abandoned on account of the difficulty of disposing of the "blue billy" or spent lime. With this process of purification which is now in use by the largest New England Company it is possible to purify as much as 14,000 cubic feet per bushel of lime without difficulty.

The wet lime purifier is the only economical way of using lime for gas purification, and it was for this reason that, when the use of dry lime was invented, by Reuben Phillips, of Exeter, in 1817, its introduction to use and popularity was slow. Yet the convenience in handling dry lime and the disposition of the refuse overcame the utilitarian and economical advantages of milk of lime, and the gas engineer allowed himself to adopt a method which reduced the purifying value of lime from 14,000 cubic feet to 5,000 cubic feet per bushel; thus over 64 per cent. of the value of the purifying material was sacrificed to convenience and to avoid nuisance. Yet a gas company in the most populous district of Boston still clings to the old method of using lime.

In the days of Phillips the introduction of dry lime purification meant a series of thin layers of lime powder in the purifiers, which, at its best, would not extract the impurities from 5,000 feet of gas per bushel. This method found adherents, and the enormous waste of material went merrily on, until May, 1875, when Mr. Theobald Forstall, of New Orleans, read his justly celebrated paper before the American Gas Light Association, "On the Proper Preparation of Lime for the Purification of Coal Gas." In this paper Mr. Forstall taught the gas engineer how to nearly double the efficiency of lime used in dry lime purifiers, and reduce the amount of back pressure from a point that was inconstant and dangerous to one of nearly uniformly low resistance.

Mr. Forstall's method of treating lime is well known, but will bear reviewing; for in how many works where lime is used for purification is the lime properly prepared to-day?

To quote from the paper: "To pass the slacked lime through a wire screen with an open mesh of one square inch area, placed at an angle of 70° with the floor. This screening reduced the lumps into granular pellets of irregular form and size, the largest of which did not exceed the bulk of a small hickory nut. The proper degree of moisture was found to be that beyond which any excess would cause the 'dough' to adhere to the screen instead of breaking through."

The ordinary dry lime used weighs 60 pounds to the bushel, while lime properly prepared by this method weighs 92 pounds per bushel. Lime purification necessitates the expenditure of large sums of money for lime and labor, and the provision of dumping ground for the waste material, and as long as it remains in use there will be a separate account on the books of gas companies for charges against "Purification." The object of this paper is to show how the work of purification can be as well accomplished and the purification account may be relegated to the realms of petty cash and incidentals.

Oxide of iron purification was patented in 1840, and in 1849 Mr. Laming obtained a French patent on oxide purification, which included mixing sawdust with the iron, and specifies that it may be revived by contact with the air and used again. The first gas company to regularly adopt the use of iron purification was the Chartered Company, of London; F. J. Evans, Engineer. This was in August, 1849, the year of the advent of searchers for gold in California. If gold had been discovered in California by a "gas man" he would immediately have written a treatise on "why it should not be mined."

Little was done with "oxide" until 1858, when the report to the Manhattan Gas Company, of New York City, on the merits of the lime and iron methods of gas purification, by Prof. Henry Wurtz, was published. This report was in favor of lime and touched the key note of what became the deterrent feature to the introduction of iron purification. The fact that it does not remove carbonic acid, and that the presence of carbonic acid is detrimental to the candle power of gas.

Quoting the words of the report:

"*Carbonic acid.*—Of this contamination whose chief detriment is enfeeblement of the illuminating power, the unpurified (coal) gas holds on an average about 25 cubic feet in every 1,000. It is to this circumstance, *above all*, that we are to attribute the high adaptation of Hydrate of Lime as a purifying agent.

"Oxide of iron in the forms employed, is comparatively powerless to remove carbonic acid." The report also states that lime purification "abstracted a portion of the hydro-carbon vapors or light giving constituents, and thus did the gas as much harm as good."

In 1871 a series of tests was made, by Edward Jones, of South Boston, to determine the relative value of lime and oxide purification. The tests covered a period of 35 days, and the average amount of carbonic acid contained in the coal gas purified by oxide was 2.12 per cent., while that purified by lime contained 0.19 per cent. The deteriorating effect of carbonic acid in limited quantities on the illuminating power of gas has been both misstated and over-estimated, and is not the same on gases of different degrees of richness. In manufacturing coal gas the amount of carbonic acid is limited and dependent upon the hygroscopic moisture in the coal, or the presence of water by rain or snow in transportation or storage.

There is no doubt that carbonic acid, like nitrogen, is an inert substance, an absorbent of heat, and as such exerts a deteriorating influence on the illuminating power of gas. There is an old axiom learned by all gas men that 1 per cent. of carbonic acid reduces the candle power 6 per cent., but to-day this axiom must be taken, *cum grano salis*. There is no doubt of the correctness of the experiments of Mr. C. W. Hinman, former Inspector of Gas for the State of Massachusetts, who added carbonic acid to purified coal gas of known candle power and observed the diminished candle power as the amount of carbonic acid was increased; he found, in 1883, that the addition of carbonic acid ranging from 1.3 per cent. to 7.5 per cent. to a gas of 19.13 candle power had the average effect of reducing the candle power 1.9 per cent. for each per cent of carbonic acid. These experiments were continued, in 1889, with gases ranging from 19.3 to 23.1 candle power, with a deteriorating effect of from 1.1 to 3.6 per cent. It also appears, that "These experiments show that the decrease in candle power is almost exactly proportional to the increase of carbonic acid; and that the richer the gas the less influence carbonic acid has." In 1890, a series of experiments show the effect of carbonic acid on gases of from 14.7 to 16.7 candle power to be a diminution of candle power of an average of 5.1 per cent. for each 1 per cent.

These results are undoubtedly true where carbonic acid is added to purified gas, but in 1887 there was a paper read before the American Gas Light Association, by Mr. C. W. Blodget, of Brooklyn, N. Y., on "The Comparative Illuminating Power of Gas Purified with Lime vs. Oxide of Iron," which, by its careful preparation and the skill used in obtaining the results, has made it a classic in gas literature. This paper admits that carbonic acid is detrimental to the illuminating power of gas but demonstrates beyond doubt that lime robs the gas of hydrocarbons which are unaffected by oxide of iron, sufficient to equalize the effects of carbonic acid. The facts elucidated by this paper were admitted by the best authorities on gas manufacture, yet each year brings forth a crop of papers which admit the facts established by Mr. Blodget, yet ask the question "whether it is cheaper to use lime for purification or pay for the extra enricher required to supply the loss of light by carbonic acid in oxide of iron purification?"

Before proceeding with a description of the method of purification employed by the San Francisco Gas Light Company, it may be of interest to state that lime purification does not always remove carbonic acid. The removal of it depends on the moisture of the lime and the rate of speed of purification. The best illustration of this is the following analysis made of gas at the outlets of the washers and wet lime purifiers where it was required that 15,000 feet per hour should be purified by each box.

Outlet to Washer.		Outlet Wet Purifier.	
CO_2	1.68 per cent.	CO_2	1.09 per cent.
"	1.75 "	"	1.50 "
"	1.07 "	"	.94 "
"	2.07 "	"	1.15 "

In the manufacture of water gas the amount of carbonic acid is entirely dependent on the form of apparatus and the skill or carefulness of the gas maker. In decomposing steam (H_2O) in the presence of heated carbon it is well known that the first reaction is

to carbonic acid (C O_2) and Hydrogen (H_2), and these gases in passing through more heated carbon become 2 C O and H_2. The gas maker may by carelessness retard the second reaction by a shallow fire, holes through the bed of fuel, or the introduction of steam with the oil; but in works where a system of frequent analyses of the gas is in vogue, any lack of care is soon discovered, and any excessive amount of carbonic acid is as soon made known as a piece of machinery that fails to do its work.

In San Francisco the method of purification is refined to such an extent that the cost is a mere trifle and not worthy of a separate account on the books of the company. Oxide of iron is made of 2 bbls. coarse sawdust, 1-2 bbl. slaked lime, 1 bbl. copperas, 10 lbs. iron borings and 1-2 lb. sal ammoniac.

The lime and sawdust are mixed, and the copperas, dissolved by steam, is poured over the mixture. The sal ammoniac is dissolved in water and mixed with the iron borings, after which the borings are mixed with the lime and sawdust. This mixture is very rich in iron oxide, and is placed in the purifiers at least two feet thick. Sawdust is preferable to chips or planings, as it presents more surface for gas purification and is less liable to mat together.

The iron oxide is revived in the boxes and is not removed until it has absorbed from 40 to 50 per cent. of sulphur, and is useless. The life of the material properly cared for should exceed two years. The oxide is revived in the boxes by the use of a simple steam jet exhauster connected with the bottom of the box. The boxes are 25 feet square, and the steam jet exhauster 6-inch. To revive a purifier the cover is raised and blocked up about one foot above the box. A wooden plug is placed in the top of the outlet pipe. The valve on the steam jet is opened and the steam turned on. Air is drawn through the entire body of the oxide and the steam and foul gases are delivered into waste pipes passing out through the roof. The oxide is kept moist by the formation of water during the chemical reaction of revivification. In from two to four hours it is revived and ready to be used again. The revivification in the boxes has been discussed for many years and was first recommended by the Rev. Bowditch, in his "Treatise on Gas." It was first attempted to revive oxide by a blast of air into the purifier, but with disastrous results, as the revivification was local, and the heat generated was so intense as to set fire to the trays and damage the oxide. The credit of first successfully reviving oxide in the boxes is due to Mr. W. A. Learned, of Newton, Mass., who applied the exhauster to the bottom of the purifier and drew air through the entire mass at once, and with no danger of excessive heat or fire.

A corruption of his method is in use in some of the Eastern gas works, where a thin iron pipe with a steam jet is placed on the outlet pipe, and the air, with a generous quantity of iron rust, is drawn down through the oxide, through the inlet pipe, center-seal, and outlet pipe, and finally discharged either into the purifying house or a waste pipe placed over each box. This system would only commend itself where cleanliness is no object, and there is plenty of help about the purifying house.

In San Francisco one man has entire charge of 8 purifiers, each 25 feet square, and his principal occupation is polishing gauges, holy-stoning the floor and cleaning windows. Once in each month the cover of each box is pushed out of the way and the oxide is loosened by a spade. On the trays beneath the oxide is placed about two inches of gas coke, to catch any particle of tar which may have passed the scrubbers and to prevent the formation of a film of naphthaline on the bottom of the oxide. In the event of any tar or oil passing into the purifier and coating the oxide, it may be removed by turning and sprinkling it with lime water or a solution of potash in water.

In removing oxide from the purifiers after each change and the handling and turning over during revivification the oxide becomes broken and small particles of iron oxide are separated from the mass of sawdust. When it is replaced in the purifiers there is danger that these small particles may be taken up by the gas and carried forward even so far as the consumer's meters, when it is revived in the boxes, this handling and breaking up is avoided, which is an important advantage.

Discussion.

The President announced that it was desirable to have all the discussion possible on such an important subject.

Mr. Clements, of Red Bluff—I think that the paper should be published in pamphlet form, as the Association has received much benefit from its reading, and it is desirable to have it in permanent shape.

The President replied that all the proceedings of the Association would be published in all the GAS JOURNALS, the same as they published the proceedings of all other similar Associations.

Mr. Eichbaum—Mr. Jones' paper is highly instructive and valuable to all of us. In attempting to make water gas nothing surprised me so much as the small amount of carbonic acid gas produced. In fact on several occasions it required the bubbling of the raw gas through lime water for at least one or two minutes before any precipitation whatever would be observed. Very rarely bubbling would produce precipitation when there was a small precentage of carbonic acid; in fact it was hardly perceptible. That would go to show the correctness of Mr. Jones' paper. As to the relative value of chips or sawdust, my first experience with the latter was in the East. There the sawdust was very heavy, coming from the gang saws in the pineries, it was very coarse, so much so that a large portion of it was fully as large as grains of wheat. On coming to the Pacific Coast, where we could not obtain sawdust at all, I found it necessary to secure planer chips, either of spruce or sugar pine. Redwood chips will not answer. I have, therefore, used chips since I have been here, but I do not claim any particular merit for them, as where you have established a place where you can obtain chips of the right kind, you naturally do not want to change, and I am satisfied that either chips or sawdust will answer the purpose, the one being as effective as the other. In the East, where we used sawdust, I have seen particles of iron carried forward; but here where we use chips I have never seen anything of the kind. I attribute that to the copperas depositing the iron on the surface of the chip so strongly that it is not carried forward with the gas at all. At all events, I have seen no trouble of that kind coming from it. I think probably nothing can be more economical than Mr. Jones' plan, which is maintained in a most thorough manner in the works of the San Francisco Gas Company, in San Francisco. Many of us, it is true, have crowded cellars and small space, and cannot, therefore, adopt that method, and have hard work to get at the pipes as they are situated. I think, however, it will pay everybody to adopt the plan that Mr. Jones has originated on this Coast, if situation of purifying house will permit.

Mr. Parker, of Napa—I think the reading of the paper has robbed us of any discussion. Mr. Jones in speaking of the labor about the purifying house says that the time of the man is employed in polishing, etc., and it should be the ambition of every gas man having charge of works on the Coast to attempt to put his works in as presentable a shape as possible; and Mr. Jones has reached perfection in his new works. There are many points in the paper that we can carry home with us and take advantage of; but for my part I see nothing to discuss.

Mr. Osborn, of Virginia City, Nevada—I think Mr. Jones' paper carries conviction with it. In our works at Virginia City, which are very small, we remove the oxide from the boxes every time to revive. The last sponge I made I used chips or shavings, mixed in a lot of rusty iron borings with it, put in a little lime, and I have as good a sponge as Connelly ever made; and Mr. Wylie, of Carson, has had the same experience. I think an important question in that connection is, whether drawing the air down through the boxes and reviving the oxide in the box will make more naphthaline than otherwise. I think Mr. Jones might give us his opinion about that.

Mr. Jones—I do not see the possibility for the formation of naphthaline by drawing air through the purifiers. The revivification of oxide and the purification by oxide are two separate and distinct operations. They are not carried on at the same time. Naphthaline is made in the retort or generator. It is a vapor, and under various conditions of temperature or moisture of gas, it exists, either in the form of vapor which goes with the gas, or is condensed in the form of a solid crystal. It is impossible to form it by any treatment of the oxide. It has already been formed. If it exists in the oxide it will exist there surely whether the oxide is taken out of the box, or is revived by drawing air through it. I can see no reason why it would cause any extra amount of naphthaline, and we have had no reason to fear obstruction. In looking over the top of the purifying material, after the cover is taken off, it has been found covered with crystals. That is of course due to some change of temperature, and the crystals are either deposited on the top of the oxide or the lime. This is obviated to some extent by the coke on the trays. I think coarse

coke is better than breeze. It catches every particle of tar or oily matter which, by the way, should not get as far as the purifiers. It should be taken out in the condenser. I find naphthaline is probably deposited by a shock; sometimes by gas striking a sharp angle. The chances are that naphthaline will gather on the bottom of the coke, and air being drawn through it will remove and carry it away. With regard to the chemical analysis of water gas: In one of our San Francisco works we make it daily, and in both of them we make analyses to ascertain the amount of carbonic acid. It is well known that carbonic acid above a certain per cent. in water gas is really an accident, or is caused by carelessness. It is made principally from the oil in the water gas. It takes 6½ gallons of oil to make 1,000 feet of carbonic acid gas, and it is expensive to use lime to extract it. All you have left to show for your oil is your carbonate of lime, and your labor on your purification. By carefully watching the making it can be checked to 1½ to 2 per cent., which is as small an amount as is present in coal gas. We use the Hempel apparatus in testing for carbonic acid. I was exceedingly sorry I could not bring it to Sacramento. If any piece, however slight, is broken, it is damaged so that it will be of no value whatever. I hope that when we meet again in San Francisco we can have a talk on gas analysis.

Mr. Gregory, of San Jose—I am unworthy to discuss the paper, but I think that drawing the air down through the purifiers by means of steam will have a tendency to dissolve the naphthaline, so that any danger of back pressure or naphthaline, by leaving the oxide in the boxes, should be dispelled, because you will dissolve the naphthaline in solution in the pipes. I would also say I am in favor of using shavings, for the reason that they will not go through the screen so readily.

The President—In San Francisco we simply use the steam below the boxes for the purpose of drawing air through the boxes. We do not draw the steam with the air at all. The exhauster is placed below the box, so that the steam does not come in contact with the air at all.

Mr. Jones—The old process of purification some 35 years ago was by lime purifiers, where the lime was mixed as a cream, put in the purifiers, and stirred by a man turning it a half a dozen times in the day time. He then went home to bed at night, and it was not stirred till morning. I was the other night looking over some old records of the year 1860, in South Boston, and I found in that year there were 11,241,000 feet of gas made, and in figuring out the purification by that old-fashioned method, I found the purification by that process to be 22,100 cubic feet per bushel of lime. In those days they used two purifiers in series, one for copperas in solution, and another with milk of lime; and the gas forced its way through them with tremendous back pressure, and there was .38 of a pound (which cost at that time 1¼ cents per pound) of copperas used per 1,000 cubic feet. These results are twice as good as any results obtained to-day, by lime purifiers.

Mr. Sherman, of Portland—I would like to ask Mr. Jones if there is any better way of testing than with the sugar of lead, how long he runs his boxes, and the amount of gas run through? In New Haven, just before I left the East, we put in 8 new purifiers, about the size of those in San Francisco. Four of these are running on oxide and four on lime; and in an experiment which we carried on there we found the candle power in favor of lime. I would like to know if lime is a better purifying agent? Of course we know that on the Coast oxide is cheaper.

Mr. Jones—I would reply that there is no better or simpler method of doing it. The revivifying in the box is so simple and inexpensive, that about 4,000,000 feet are passed through each box in the change. We change a box every day. We find that by revivifying in the boxes and changing often we avoid all danger of sulphureted hydrogen getting into the finished gas. In the oxide in some of our boxes to-day there is 30.27 per cent. of free sulphur in the body of the material.

On motion of Mr. Osborn, of Virginia City, the thanks of the Association were unanimously tendered to Mr. Jones for his very able paper.

Mr. Osborn, of Virginia City, then read his paper entitled

SMALL THINGS AROUND A SMALL GAS WORKS.

In preparing this paper I do not imagine I shall suggest anything new to you, but perhaps we may refresh our minds on some things forgotten. The critical observer would hardly think good gas could be made in a works, the outward appearance of which shows a lack of system and an untidy look, as is too often the case. Our benches are the next object requiring attention. In order that their life may be prolonged as much as possible, we must have even heats by keeping the retorts and flues clean, our dampers in good repair, and regulated according to the work being done. Before getting our yield up to all there is in it, figure on how much it costs to enrich the last one-half foot of gas, the cost of enricher varying according to the locality.

Where you have a market for your coke, I would recommend the burning of tar by introducing it into your bench with a steam-jet; there is no doubt its use will shorten the life of the bench, but the revenue derived from the sale of coke thus saved will more than offset your extra cost for construction, besides you have the satisfaction of knowing nothing is being wasted. I find it takes the yield of tar from 1½ tons of coal to furnish fuel for one bench of threes.

The question of purification is important, and by the ordinary "gas man" not well enough understood. While using the same material, how many of us find our gas not up to the standard at times, and we wonder why? Some of us will waste our enricher by getting the gas up to the smoking point, when we should look to our purifying apparatus for a remedy, and when once found we have gained a very important point in manufacture. Oxide has come into general use because it is the cheapest. Still, I think we can make better gas with lime.

We now have our gas in the holders, the candle power of which should be kept at a certain standard, the consumer being better suited with a 16 candle gas than with 20 one night and 14 the next.

The question of leakage is a trying one with us all, and the *absorbing* one with my Company. I have had very little experience with extensions to our mains, but I make all repairs with cement joints, as a clean fracture is soon found, but the small leaks in lead joints go on year after year and reduce our earnings. A joint leaking 2 feet per hour costs my company $40 a year in coal alone, and how many of us can locate a leak of that kind? Many think a slip-joint is necessary, but when it slips, it will in most cases leak. To my mind how much better it would be to have a solid joint, and when the moving of the ground separates the pipe it is soon reported and repaired with a smaller loss of gas than you would have with a two feet leak running for a year.

Having hastily gone through the manufacture of our commodity, the question now is how to sell it and what we owe our patrons. The question of competition in these days of high candle lamps and electric light behooves us to give our consumers the best article possible at prices commensurate with the light produced. We should be at the service of our consumers at all times by procuring for them the best appliances for the consumption of gas for both fuel and lighting purposes, solicit their trade, answer all complaints, have no mysteries in connection with our business, always bearing in mind that if we are not progressive and advancing, we must be retrograding.

Discussion.

Mr. Sherman—In Portland the mains are all laid with lead joints. The company I was with in the East have had all their joints made with cement, and the relative cost is perhaps one-half. We have never had any trouble with cement joints. Any breaks that we found were between joints; in fact there would seldom be a crack in the cement. On a lead connection we have frequently found small leaks of perhaps 2 feet per hour like that mentioned by Mr. Osborn. The question of lead joints hinges on the leakage. In New Haven where we used practically all cement joints, in summer the leakage is 6 and in winter 10 per cent. In East Portland, by looking over a great many of the joints in our mains we have reduced the leakage to 7 per cent., from a former maximum of 20 per cent.

Mr. Jones—When I arrived on this Coast from the frigid East, I was a disciple of cement joints. Now, it is a well known fact that the expansion and contraction of lead and iron are as three to one. This difference will cause the lead to squeeze out of the bell, leaving a space between the lead and the iron. It is of course infinitesimal, but in the aggregate it is great. That, however, would not apply to places where they have no frosts, as in California, for instance. I wish Mr. Osborn would tell us how he makes better gas with lime than by oxide purifaction.

Mr. Osborn—All I know is that I find better gas. Mr. Jones gave us the analysis and the action of purifiers, but I only give the practical results as I find them—that I had better gas when I used lime. I use oxide now entirely. One point in connection with lead joints: Where the ground is subject to disturbance, caused either by mining or changes of temperature in the ground, we often have cracks in our pipes. I remember one time (in 1880), a crack in the pipe itself was more than 2½ feet, although the cement joint never broke.

Mr. Eichbaum—There is no question in point of expense that the cement joint is preferable to the lead joint, but where, like in San Francisco, we are called upon to lower pipe or to raise it, or to change it in accordance with change in street grades or other cause, it is much easier to handle lead than cement joints. As we all know on this Coast the temperature is quite uniform and we have no contraction such as takes place in the Eastern States, where I have often seen the ground frozen to a depth of 4½ feet, and in one case seven feet deep. With such temperatures prevailing the pipe must necessarily contract, and lead will never go back; there the lead often pulls out to the extent of half an inch. Here in California the temperature does not vary more than four or five

degrees in the year, probably. I, therefore, say that in San Francisco lead is preferable. The cement joint is tighter and more secure than the lead joint, although it depends a great deal upon how the joints are put together, and again how much lead is used. I have seen careless workmen sometimes neglect to calk the under side of the joint. If a person is stingy with lead he will have trouble all the time. If sufficient lead is put in and calking is tight, you have no trouble even though the pipe lasts a great many years.

Mr. Decker, of Fresno—I suppose I belong to the fraternity of small gas works, and that I know much less than most of the gentlemen on this Coast about making gas. In Fresno we have more "contraction" than elsewhere, especially in *real estate*. Not only will the pipes "go broke," but a great many of us will also go broke, unless the stringency is loosened. In Fresno we do not know much about either cement or lead joints, as we use all wrought iron. If the pipes down our way are laid in the evening, and the ditch is filled at once, we have no trouble to speak of with broken pipes. Sometimes the socket will stand, and the pipe break somewhere else. If the pipe is laid in the heat of the day (it is sometimes 120 degrees in the shade at our place), and the temperature changes at night, unless the pipe is covered, a break will come, not at the threads, but in the body.

The President—I think the question of joints depends practically upon locality. In San Francisco, on Fifth Street, and in that section of the city, the ground has gradually settled and we have raised our pipes five or six times. We have put our pipe within two or three feet of the surface, and still they have gone down in two or three years. That soil is constantly settling, and with cement joints we would find them breaking all the time, while with lead joints they give. We had a 24 inch pipe on the Potrero, and our experience there proved what can be done with lead joints. This pipe was about 1,800 feet long, and we had to raise it up some 20 feet from where it rested and then fill in under it. It was there for some months, when suddenly it gave way and went down over four feet, still it did not break because of the use of leaden joints. If we had had cement joints there, they would have broken and the city of San Francisco would have been without light. We watched that pipe for a year and a half, during which time it settled more than once, and we would raise it and calk it back again as far as we could. I, therefore, think a great deal depends on locality. Where the ground is stable and settled cement joints are the best; but where the ground is constantly moving and shifting lead joints are the best.

(On motion of Mr. Eichbaum the thanks of the Association were tendered to Mr. Osborn.)

Mr. T. R. Parker, of Napa, then read his paper, entitled

HOW WE DO AT OUR HOUSE.

In considering the matter of our Association and its annual meetings, when Mr. Jones presented for our consideration an emblem typical of our calling, a circle of pipes, having no "dead ends," surrounding a burner with a "full head of gas on," and on its adoption stated that he hoped each member would do his part, be it ever so little, towards making our meetings interesting, it occurred to me that there would be no "dead ends" in the Pacific Coast Gas Association, and that we come with "a full head of gas on." The question now is, what shall our gas consist of?

With as young an institution as ours on this coast, with its first meeting and greeting just placed to its credit, would it not be well first to "blow off a little gas" by stating what we are doing in our theories, or our practices, mechanical or financial, and how we are doing it, in order that we may be corrected in our mistakes, if any, and profit by the adoption of "parts" or points in the manner of conducting our works or business, in fact, "condensing" and incorporating the best ideas here presented, eliminating that which has proven obsolete, and by the advantage thus gained advance to the front. In this way we may make our meetings practical as well as social, and our members may return to their several works feeling a satisfaction of knowledge gained and acquaintanceship formed, thereby fostering a spirit of emulation that may redound to the general good of all, and result in making our Association an institution that will be appreciated, while its meetings will be looked forward to with anticipations that may ever be realized. Such will, I hope and trust, be its future.

Those of us who were in the business on this coast in the early sixties know with what crude and primitive apparatus we had to work—iron retorts, no exhausters, barrels for condensers and scrubbers, wooden purifying boxes, and all connections about the works outside of the retort-house made by some local tinsmith from galvanized sheet iron. Boghead, Lesmahago, and Ince Hall were the familiar names of coals then used, while from 8,000 to 9,000 feet of gas was considered a good yield from these gilt-edged coals. We then charged 150 pounds to a retort, three in a bed. By-products, with the exception of coke, were considered of no value in those days, and were all allowed to run to waste. Gas sold from $7 to $10 per 1,000. Wool-waste, castor beans, and pitch pine were auxiliaries. With no local competitor in the form of a corporation to contend with for commercial or municipal favor, with electric lighting looked upon as a scientific novelty, or like a comet, to appear and disappear, frightening timid stockholders and tending to concentrate depreciated stock into a few hands, water gas projectors were pooh-poohed at, and were handled unmercifully and without gloves at Association meetings. Their candle power fluctuated; the gas stratified in the mains; it was destructive to meters; and the air was blue with talk of carbonic oxide or carbon monoxide forming a carbonic dioxide. It was most decidedly a dangerous gas that required special legislation to restrict.

But all these belong to the reminiscences of the past, although I dare say there may be some works in existence that have changed but little, going on in the same old routine, owing to their isolation and lack of intercourse with other and more modern working, such intercourse as this Association is now endeavoring to inaugurate on this coast. Some wrinkles, therefore, may be brought out owing to these isolated cases—cases of emergency, where, from the force of necessity, which is the mother of invention, one is thrown on his own resources—being called on for an original thought in overcoming a difficulty. We want such men to come into our Association and not entirely hide their light under a bushel; for many good practical ideas have emanated from small works.

But how stands the case to-day? Clay retorts—five to nine over one fire, turning out 11,000 feet and over of gas per ton; the principle of combustion in furnaces better understood; by-products considered to swell the returns on investments; gas appliances sought for and introduced; gas reduced to from $4 to $2 per 1,000. From being a parasite the electric light has developed into a satellite, retaining all the peculiar characteristics of the former with the persistence of the latter, while 33 per cent. of them are now being operated by gas companies, and, as a rule, they are fed from the gas pocket and maintained on the principle of fighting the devil with fire, should occasion require.

As for water gas, from being ignored by gas companies plumed with conceit, they were finally noticed, then tolerated, and are now countenanced, and the result is that, from being of an uncertain candle power and an objectionable carbonic oxide producer, it has ceased to be talked about as an article of diet, and is now being looked upon as the savior of large coal gas companies as a paying investment, the two processes combined promising a most excellent quality of gas. The name of Lowe will go down to posterity coupled with such names as that of Clegg and other pioneers of the light-producing fraternity; for water gas generators are now found in almost all large and well constructed gas works. But to return to my subject, for in a spirit of restrospection I have digressed. We of Napa have comparatively new works, planned and erected to suit the conditions of our lot by the late Mr. John Fullagar, formerly of the Cincinnati (Ohio) Works. We use a regenerative, recuperative setting, built, as an experiment, of odds and ends, or remnants of former benches, with the exception of the retorts. They are what is known as "belted," four belts of about eight inches wide being cast or moulded with the retort completely around it, forming an oblong square set one above the other. These belts make a good, firm bearing, with the least possible amount of shrinkage or settling. It takes the place of the saddle block tile, and I like it much better. They are set very quickly and with much more satisfaction. The inside dimensions are 16 inches from the mouthpiece end, 30 inches wide, 16 inches high and 8 feet 6 inches long. The skeleton is 8 feet 10 inches wide, 9 feet deep and 13 feet 6 inches from the top of the ash pan to the crown of the arch. With it we are able to maintain an excellent uniform heat. I submit a plan for your inspection. It is arranged so a tar-burner can be introduced 2 feet six inches below the regenerative flue-hole. We clean the furnace once every two or three days.

In setting retorts use a trestle with a traveler overhead; use chain pulleys for hoist and run straight in onto the roller. It is cheaper than a derrick, and in some respects I like it much better. We have been using a sheet steel lid, weighing 18 pounds, which is 27 pounds lighter than cast iron lid. Use luting, as of old. The screw-bar has a swivel end to prevent wearing or boring into the lid. We use the barrel-head rake for drawing charges. Our hot-coke barrow has a wrinkle which I have not seen at other works on the coast. I refer to tripping the door at the end and spreading the coke when dumped. The coal is weighed in the shed and brought in on a truck and charged from same, leaving the floor space clear to work on. Our condensing and scrubber room is large enough to admit a water gas generator, which we are thinking of introducing at an early date. We use a steam jet exhauster and iron sponge, and revivify in the boxes with steam-jet.

For tapping the mains we use a Mueller tapping-machine, with wheel attachment instead of a ratchet, there being no waste of gas to speak of, and consequently no heading, while you have drills and taps at one and the same operation. I consider it one of the best tools we have on the place. We have now had it in use for ten years, have made 1000 tappings with it during that time, and to-day it is as good as new. We have a wheelbarrow fitted up on springs for street use, with the necessary tools for running services and tapping mains, made from wrought iron of from 1 inch to 2½ inches. Use a wheel wrench to screw pipe together, instead of tongs, running the whole thread into the joint. Use tallow on the threads in place of lead. From one to three men can set up on the wheel, if required. It saves marring the coating on the pipe, and from 3 to 6 lengths can be set up at a time.

In laying cast iron pipe of from 4 inches up, yarn, pour and calk 3 lengths at a time, outside of the trench. It furnishes a better chance for inspection, while the men are given a better opportunity to do good work, and there is also a saving of time in digging joint holes. Use a rubber clamp in place of a mud roll. Also use what is known as an inside and an outside chisel, bringing the lead up in the manner of a frustrum, then calk down flat until the pipe rings or the chisel rebounds. Use tripods and differential pulleys to lower and swing home, using tarred gasket, twisted hard and tallowed, driven home with a blunt yarn iron. Leave about 1¼ inch for lead.

I believe that a joint well yarned and tallowed, driven home hard, to be the best part of a joint; on the same principle that a gland is packed, the lead acting as a follower and the calking setting up on it after the manner of the nuts on the stud. If pipe is placed together in sections as mentioned and not well set up, it will show on the pipe when in the slings by sagging slightly at the joints. That rarely occurs with us, however, unless we have a green hand on the pipe, the men generally understanding what is required.

Use a leveling instrument in laying out trench work and getting grade and in finding the depth of water or other pipes at street crossings, going either under or over, as the case may require, making as few drips as possible. When the trench is dug and the pipe is down, prove it with the instrument, and in putting sections together do the same thing in order to get them straight and true.

In extending new lines start two lengths from the point to be extended, laying the pipe complete, and when ready to connect, bladder or bag the live mains. Enter one end of the two lengths on the new and the other end in the old, bringing them together at the top in the form of an inverted V; then lower, drive and pour, avoiding the use of sleeves. Tamp the earth well to the level of the top of the pipe line, giving it a good, solid backing, and finish with water tamping. Use stop cock and boss casting for services at the curb.

In collecting make out skeleton bill and stub with previous statement, date and name in book form. Take statement, making out bill at the meter, and collect; but one trip being thus required for the entire business. This, I believe, gives a general outline of "How we do at our gas house." All of which is most respectfully submitted.

Discussion.

Mr. Jones—The paper of Mr. Parker is a most excellent one. He brings out the wrinkles which show the careful management of a small gas company in California. It shows the treatment of details, which are of prime importance, in order to provide for dividends. In the future of the gas business the man who most carefully looks to the matter of details, and saves at every point, will be the one to be successful in competition with electricity or coal oil, or any cheap form of illumination. I do not mean to say that electricity is a cheap form of illumination, however. I think Mr. Parker's idea of calking the joints on the side of the trench is a good point, on some accounts. Mr. Eichbaum, in his remarks, spoke about careless workmen sometimes neglecting to calk the under side of the joint. That is, of course, obviated by Mr. Parker's method. He sees that the work is thoroughly done.

The President—In lowering the pipe in the ditch might it not be that the joints would be sprung?

Mr. Parker—The only thing we can find is simply the spring of the cast iron itself. If for any reason we wish to raise them, instead of raising 4 lengths we raise 6 lengths. In my estimation the main thing about a lead joint is the sufficient use of lead; the hot lead goes in and the tallow in the yarn is melted, leaving a homogeneous mass.

Mr. Eichbaum—It seems that Mr. Parker has a pet idea of fastening 3 or 4 joints together. The question is whether it is cheaper to shovel off the dirt, which becomes necessary in that case. Some of us might think it cheaper to put it together in the ditch rather than move so much dirt. For instance, where we have to go from 5 to 7 feet deep, we would have to remove a great deal of earth, unless we put the pipe together on timbers, and then there should be some arrangement for a man to reach to the top. I think, from my experience, there would be no economy in that.

Mr. Parker—In digging our trench the earth from the bottom is put next the roadway. The pipe is put on a line with it, or on the sidewalk. We use 16-inch skids to move them up. The earth cuts no figure. We have laid some 45 carloads of pipe at Napa within the last 10 years or so, and that was our method of putting our entire line together. We dig one joint hole to every three joints, while by the other method you are digging a joint hole every 12 feet; by our method the chances of settling at the joints is much less. In our way it leaves it good and firm. We use the levelling instrument and prove it up, before putting in the trench, thus getting a good foundation. Much does depend upon the depth of your trench; on this Coast it is generally 3 feet.

(On motion of Mr. Eichbaum the thanks of the Association were unanimously tendered to Mr. Parker.)

The Secretary read an invitation from one of the State Prison Directors, inviting the Association to visit the State Prison, at Folsom, which was accepted, by motion unanimously adopted.

Also a communication from Mr. Oscar B. Weber, of New York, offering a prize of $60 per annum for the best paper submitted on "coal gas," allotment of same to be made by directors. The offer of Mr. Weber was accepted, by motion unanimously adopted.

The Association then inspected the pre-payment meter, now being extensively and satisfactorily introduced by the San Francisco Gas Light Company.

Mr. Steinman, of the Capital Gas Light Company, of Sacramento, remarked as to his experience with insurance companies, in the recent loss of their electric light works by fire, that owing to the four-fifths clause in the policy, and being co-insurers, on the final adjustment, after paying the appraisers, etc., etc., they would owe the insurance companies a few dollars when settlement was made; that he had recommended to their Directors that they carry no more insurance at all, but insure themselves, and concluded as follows:

"Three days after our electric light works were burned down, which entailed a loss of $150,000, we were able to light the city. We are having our machinery repaired in San Francisco. One engine we are having re-built here, and we were able to supply the whole city with electric lights and commercial lights also, last night. We are also running the street cars."

Mr. Quilty—The San Jose Light and Power Company found themselves in practically the same condition as to insurance. Our insurance bills were very heavy, and after reading our policies over we found we were co-insurers.

The Association here took a recess until half past one o'clock, P. M.

FIRST DAY—AFTERNOON SESSION.

The Association was called to order at 1:30 P. M., President Crockett in the chair.

Mr. Quilty, of San Jose, then read his paper on

THE RELATIONS OF LIGHTING COMPANIES TO THE PUBLIC.

It may be said, as a general proposition, that all lighting enterprises are carried on by incorporated companies. There are a few exceptions; the cases where municipalities or governmental institutions furnish light. Because nearly all lighting enterprises are carried on by incorporated companies, the public has classed light companies with other corporations, and views them with the same distrust and disfavor.

I contend that, so far as the public is concerned, the manufacture and sale of light is one of the most honorable and legitimate of enterprises. It is generally carried on by incorporated companies, simply because no single individual can build the extensive works, place the miles of mains and distributing systems, and carry the immense stock of coals and oils required. The business requires large capital. It demands the talents of more than one man in its management.

Lighting companies differ from all other corporations. They are cradled in competition; their life is one of competition and opposition, and whatever profits are made from them are well earned. In small towns their competition is, first, with candles and coal oil, naphtha and gasoline; second, when a town becomes a city, then there is always the competition of capital; so that it very rarely happens that any lighting company has any long run of large profits.

Lighting companies differ from water companies in many things. Water companies, by buying up the water sources near and surrounding large towns, acquire practically a monopoly of the water of that district. They then simply collect and distribute it.

Street car and railroad corporations acquire the right of way along certain streets and arteries of trade, and as cities grow their rights become more and more valuable, and because of having the right of way they are absolutely safe from competition. Other corporations while dealing with the public and exercising public rights and functions are free from public inspection or interference. Mining companies own their own claims, mines, etc.; lumber companies own their timber lands, mills, railroad, etc. Other companies own their patent rights which give them protection. All other corporations have some protection or safeguard in some way or another for the money invested; they have private rights which cannot be interfered with, or rights of way and franchises which cannot in the nature of things be given to another, or exclusive privileges, or natural advantages, as in the case of water companies, that cannot be duplicated.

The lighting business has none of these exclusive privileges, franchises, rights of way, or natural advantages. To the general public and municipalities, a lighting company really is no more than any other manufacturing institution, with the exception that in order to sell a part of its products it has to use the public streets. We think that the public and municipalities should control streets and highways, and direct and regulate the manner in which lighting companies use public thoroughfares, but when municipalities and public officials go further and examine into books, accounts, and private profits or losses of any lighting company they are encroaching on private rights. They might as well examine the accounts of milling companies, because bread is life, or regulate sugar refineries, breweries, ice companies, and other corporations which more closely affect human existence and happiness. Many of the above corporations furnish materials for which there are no substitutes—materials which are necessaries of life. Light is an artificial product and a luxury of life and has many substitutes. Hence, beyond making a slight use of the streets, a use which with gas companies is neither noticed, seen nor felt, and which discommodes no one, light companies do not differ materially from other commercial enterprises.

There are many reasons why the public should interfere with and regulate the sale and use of water; but if that public right of interference and inspection should be carried into other enterprises, such as the sale of light, flour, meats, etc., etc., it will result in what is called "Paternalism" in government; a paternalism which would regulate things pertaining to the physical wants of citizens. Coxey's army marching to Washington believe in paternalism; that the Government should provide for their wants. Such things have happened in the world's history before. Paternalism always resulted in despotism. So, then, we can safely infer that the spirit of prying into and regulating the price of lighting products to suit the whim of the public, and the disregarding of the

capital invested, is a species of paternalism and is foreign to the spirit of our Republican institutions. The municipal ownership of lighting works, while apparently for the benefit of the people, is in many cases unsatisfactory. Very few cities have made a success of them. The manager of a large lighting system must be a man of almost universal resources and phenomenal mental capacity. He must, first of all, know how to handle men, must be a financier, should have some of the capacity of the architect, understand chemistry, be able to consider the legal difficulties connected with the business, should be practical and experienced. How many municipal light works have such managers? None. Every change of administration would make a change of managers in the light department. The political power of the employees of the light department would be too strong to leave unchanged. A change of managers of the light works, as we all know, is a radical one, and the light department would, in the course of time, become a part of the great political machine.

I will now close by saying that the public should not be too hasty in passing judgment on lighting companies. The business is an arduous, expensive and dangerous one, requiring constant care, watching and labor; involves the expenditure of money, and very careful collecting and husbandry of many small returns, to earn a reasonable dividend on the capital invested.

The political handling of large commercial enterprises, the control of numbers of employees and collecting and disbursing large sums of money are not in accord with the original spirit of our Government, and without question are demoralizing to political honor and honesty.

Let us so conduct the lighting companies we represent that citizens will not complain nor municipalities be called on to interfere. By keeping up the efficiency of our works, by turning residuals and waste-products into money, by stopping leakages and waste, by economy and judgment, we can furnish light at fair figures and make reasonable returns to our stockholders.

Discussion.

The President—If the matter is sifted down with regard to corporations, it could not be much better expressed than in Mr. Quilty's paper. If you reflect that in the United States we only have two or three important municipalities that own their gas works—the cities of Philadelphia, Pa., Richmond, Va., and Wheeling, West Va., you will find that the price of gas is much higher there than in neighboring cities. Other cities have been for years charging $1.25 per 1,000 and less, but in the cities mentioned as owning their own gas works—particularly in the case of Philadelphia, where up to the beginning of the year the rate was $1.50 per 1,000—have kept the prices up, while the works cannot be carried forward as economically and cheaply under the political changes of municipal control as under the exact methods of private ownership. In England, there has been much ownership of gas by the cities, and I do not know much about the results there; but we all know that in America the private ownership of gas has resulted in a much better quality and cheaper service.

Mr. Steinman, of Sacramento, moved that the thanks of the Association be tendered to Mr. Quilty for his able paper. "Although he does come from San Jose," the would-be Capital. Mr. Clements of Red Bluff thought Mr. Steinman's motion a "Capital" one, and it was unanimously carried.

Mr. John A. Britton, of Oakland, Cal., then read his paper on

PROPER BOOKS OF RECORD.

A gas company without proper books of record may be likened (to speak in parable) to a certain man who went down to the great seas in a ship without chart or compass, starting on his voyage with the sun for a guide by day and the moon by night, and as the winds tempered themselves to his success he sailed into many strange countries and there bartered with the natives, and when he had filled his ship with strange and wondrous goods of great price, he homeward turned his prow, with his mind filled with visions of great and surpassing wealth; then, behold, was the sun obscured by clouds, and the moon shone not, and storms arose, and the bosom of the sea was troubled as with many stopped drips, and the winds came and beat upon that ship, and after many days it foundered upon a rock, and the place that once knew it, knew it no more, forever!

What constitutes proper books of record for gas companies may be a debatable question, but it will be my aim in this dissertation not to prescribe any particular method for the guidance of any company, nor to endeavor to alter your present plans (which without doubt are grounded in your minds), but to endeavor to place milestones on our progress as an Association, to be taken advantage of by such as walk that way.

I am aware that most companies have systems of record that they regard as superior to others, but in an experience of 20 years with gas companies and their accounts, involving every detail of a business of from 25,000 daily output to a 500,000 one, I am convinced that most of the small companies on this Coast do not possess the first requisites to the proper keeping of records, that it is the right of every one interested to demand should be kept. The too frequent reference for aid to the treacherous memory is dollars daily wasted, while a record properly kept is dollars saved.

You have doubtless heard that "brevity is the soul of wit, and tediousness the limbs and outward flourishes," and perhaps wonder why I don't make an application of that rule; therefore, reading your minds I will be witty, and take up the subject-matter of my paper in the hope that I can teach one of you some little trick of records; and if I succeed in doing so then will not my labors have been in vain, and, you will pardon my vanity, this meeting of the Pacific Coast Gas Association not without good results. I propose to take up the subject by beginning at the commencement, carrying you through all of the departments of your business, prescribing homeopathic doses of records that the pills may be more readily swallowed.

Book No. 1, according to my methods, should be one that might be termed a "Superintendent's Hand Book." It should be of liberal dimensions, and contain the following: First, a ground plan of the works (not necessarily drawn to scale), showing the position of retort house, generator house and blower, exhauster and meter room, purifiers and holders, scrubber, washer and condensers, tar wells, boilers and engines, with accurate distances and sizes of each part contained, such as each bench of retorts, sizes of generators and superheaters, also location and sizes of all pipes leading from hydraulic main to exhauster, scrubber, condenser, purifiers, holders and tar wells; location of all drips, also space set apart for coal and oil storage, with capacities of each, and such other structures as may be a part of each particular business. In the space given to each holder or other portion of works, plainly mark the capacities, size and date of erection, and at a glance you will have an historical statement of your works, that now, it is safe to assume, to find out you have to delve through musty tomes or mustier memories.

Let me ask how many of you have such a record? I pause for a reply. None. Then, some have I informed. How many depend on "Mike," or "Pat," for this information—those old stokers who are the living historians of every gas works, and the Superintendent's handbook of information. None of us have a mortgage on our positions, and it is our bounden duty to be able, when the time comes that we must lay aside our robes of office, to render a good account of our stewardship, and we can only do that by knowing positively what we have had and now have in our keeping.

The book spoken of should be divided into heads embracing all of the machinery in use, under which shall be entered details of date of setting benches, their cost, cost of renewal, and work done by each, coal carbonized, etc., life and cost of purifiers, and date and items of repairs, with quantities of gas purified to each barrel of lime used, or barrels of oxide; cost, size and capacities of holders, etc. All of these items will suggest themselves to anyone adopting a system of this character and may be made to fit individual cases. It may seem much in detailing, but there is no Superintendent that could not fill out all, with the expenditure of one hour's time each day, and this time can be taken from the noon-day nap, or the unnecessary waste that belongs to every man.

Book No. 2 should deal with manufacturing results in daily form, giving kinds and quantity of coal and oil used, daily statement of station meter (if you have one), make of each kinds of gas, heights of holders, amount sent out, candle power average, and average yields of material, and all summed up at the end of each month for reports. This book should contain marginal reference as to conditions of weather, an invaluable record for standing off the impatient consumer who swears that he has burned less gas this month than any month since he was born, and yet his bill is twice as much as before.

Book No. 3 should deal with record of permanent and temporary mains, giving in detail date when laid, location, size, and number of lengths, distance from property line, which side of the street, where pipe falls, locations of all drips and all fittings, giving size of same, depth of pipe, exact at crossings, pounds of lead and gasket used, with cost, and cost of labor for laying, also character of soil in which pipe is laid. All of this by proper instruction your foremen can report with each job, and I know you will concede all of it to be valuable and necessary, and yet I venture to say not two per cent. of the companies here represented have such a record in their office. A service man is sent to tap a pipe for connection, and he wastes, in looking for location of main, in one month as much money as it would take to have this information compiled. It's all right so long as the old man remembers, but a new man—"Aye! there's the rub."

In conjunction with this book there should be a map of your city with the mains laid out, showing all crosses, drips and fittings, with sizes properly marked. As to the method adopted, the company which I represent has on the map a single line representing the temporary or wrought iron mains, a blue line representing a three inch pipe, two lines four inches, and so on for larger sizes, so that you can glance at your map at any time and tell where your dead ends are, you can tell where your mains are laid, their size, the side of the street on which laid, etc., and it will save many dollars in the course of the year.

Book No. 4 should contain a record of services, giving date laid, size, name of street, distance of tap from nearest corner, and date when service is cut off, if it ever is. Dead services are a source of great annoyance to gas companies, certainly where they have 1,000 or more consumers. They are also a source of great leakage, especially in the gutters, where the leakage is enormous, because there are many leakages that are almost imperceptible. I have in my mind an instance where a leak was reported upon a street for some time; men were frequently sent there, each joint was taken up, and in every case it was found to be tight, and at last we discovered the leak in the gutter. It was a dead service. Leaky services cost the company which I represent more money than it would have cost to have had a map with the services properly delineated, in

any city that I know of, with perhaps the exception of San Francisco. Each service should be numbered and laid down upon the map before referred to.

Book No. 5 should be a meter record in ledger form, containing date of purchase of every meter, its size and kind, maker's number, and company number. Every company should adopt a plan of having every one of its meters badged with its own number, as purchased. German silver badges can be purchased for little or no money, and when meters are purchased it takes a man but a few moments to attach this badge. Proper dies can be made cut to number as high as wanted, and it will be found a most valuable thing in the records. The books should show at all times where the meter is in place, and by a series of ruling you can treat the account of a meter the same as you would a debit and credit account, or as you would the account of a consumer. The book containing your record of meters set and out should be balanced every day, and the meters in stock should agree with this balance; proper tags for placing and taking out and changing of meters should be provided, and entries made from them, and not from notes of meter man. The usual rule of gas companies, in my experience, is to have a meter man start out with a meter and a little notebook, who is expected to place the name of the street, number, etc., in that book, which is checked off semi-occasionally. Little tags can be issued from the office with a certain check to show to your meter man, and returned when the meter is set or taken out, and you then have a perfect check upon his actions, while you also have a check upon the meters. I have known meters to be in place, in this State and adjoining States and Territories, in a number of cases for over five years, without the knowledge of the gas company, the amount of gas so lost being more than enough to pay for all this trouble of accounting. You would hardly think such a thing possible, but it has come to my knowledge, where meters have been out unknown to the company, and the gas consumed by tenants in various places for at least five years owing to an improper or entire lack of the checking of meters. Very few superintendents know how many meters they ought to have in stock, how many they have set, or how much their balance ought to be. If you had a $5 piece instead of a $5 meter you would be very sure to keep an account of that, and I cannot see why superintendents do not preserve the same accuracy with a meter that costs $5, as they do with a cash account that shows $5. That loss of the meter is a loss of $5. By the system in use in the company which I represent, it is as impossible for a meter to be set or taken out without knowledge as it would be for a man single handed to carry off our holder. I have known bookkeepers to erase carelessly a record of a meter on consumer's account; a meter man may set a meter, and under old rules forget to put it in his book, and unless the city is very small and a Superintendent does all of his setting and taking out of meters, mistakes without books of records are apt to and do occur where the loss is very great.

A closing book should be provided wherein is entered the name of party quitting, with statement of meter at date of same, and name of new occupant; closing bills, different in color or form from regular accounts should be made out, to indicate that it is a closing account with that person and that meter.

There should be a separate day book and ledger for the entry of all sales by company, embracing coke, tar, gas stoves and service connections, kept in regular single entry bookkeeping form, and bills should be made out as soon as an article is sold, the account should be entered in the book and posted direct to the ledger, and your account should not be kept in the form of tags or mental memorandums, as is very often the case.

The consumers' books should be ruled to contain a register number, excepting where the street system is used, number of street, size of meter place; this latter item being useful in the setting or changing of meters, as time is often lost where a meter man goes to a house supposing the connection to be for a three-light meter, and on his arrival discovers he should have brought a five-light, and has to make an additional trip to yard.

The book of meter sets should be separated from outs, and changes of meters should also be kept in a separate book; this latter book should have a ruling to place the test of each meter removed, as a matter of record for bookkeeper to show consumers for whom you may have to make an average bill. Very often when you change your meter and submit it to a proper test, you find it has been registering all the way from 10 per cent. to 100 per cent. more; while the new meter shows a different consumption, requiring a different bill. You find it was not registering correctly. Average bills, with the ordinary consumer, are like the red flag to the bull; shaking his locks at it, he threatens to tear down your office, and cries, "Monopoly!" But by submitting written proofs to him, I think you can temper the wind to the shorn lamb, as it were.

A book should also be kept showing the date, number, size and kind of each meter tested, with the amount of repairs made on each, and as nearly as possible the cost. This information may be useful and is certainly valuable in tracing the cause of meters failing to register. I have in mind a case of a meter that would regularly fail to register in a certain house once every 4 or 5 months; when with our system I had traced this to three changes I commenced an investigation and found that the careless meter man had set the new meter each time under the house on the damp earth. I had the service changed, placed the meter upon a wooden stand, and it has been doing good work for over 3 years. I have done the same thing with all other meters in the same positions, and it pays; and I attribute the failure of a number of meters to register correctly largely to the fact that they are set under the house, or somewhere upon the damp earth. My experience of 20 years leads me to believe that dampness affects the diaphragms of meters and causes them to rot more readily than if they are in dry, high places. This you may be able to know without a record, but the record helps you to find such difficulties more readily.

Each superintendent should have a properly indexed book containing references to tests of coal, pipe, difficulties overcome in the various parts of his business, and notes of such matters for reference as will help from time to time to make the management of his business the easiest possible. He should by tabulation know at all times the amount of his send out, by comparison from year to year, the number of miles of mains under his control, which, by the street main book, I have pointed out as No. 3, would be at all times obtainable; the number of meters and services, and be ready, by reference, to tell of any portion of his business from Alpha to Omega.

To sum up the intent of this paper, whatever is done should be committed to paper, in proper form, so that future generations that will consider may have the same knowledge that you and I possess. We have no right to lock it up in the recesses of our memory, and the time when a man could for his position trade upon his secret knowledge has passed, or should be passed to obscurity.

In the hope that seeds have been sown that may bear a fruitful harvest in methods of keeping records, I desire to say, that I am willing to afford to any member of this Association any help in the proper starting of books that may be required, believing that it should be our purpose to help each other.

Discussion.

Mr. Quilty—That portion of Mr. Britton's paper concerning the setting of meters and their non-record is something that occurs with many small companies. In San Jose in a couple of rooms that were always rented by students and others, it struck us as somewhat singular that the rooms were always occupied, but we did not understand it until one day the janitor asked me if those boys up there were able to pay for all their light, when on investigation we discovered a meter at work of which we had no record. It seemed the students were always able to get their gas free. We ascertained also in the instance of one or two dwelling houses that always rented well, the secret was a case of meter at work, of which track had been lost; free gas was there. On the incoming new administration in our Company a man checked up every house, and we now think we collect from every consumer, but no one can be certain of that without some such check as Mr. Britton suggests. There is too much loose handling of meters by small gas companies.

The President—Even a company supposed to do business in a practical way may still lose a meter. Our company has a great many bookkeepers, and each one has a certain district in which he has to check off his consumers. As the daily records come in and meters are set during the different dates, it is the duty of each bookkeeper to go to the general application book, from which he takes the meters in his district—that is, he takes the names of the applicants for meters, the number, the size and statement of the meter, all of which he transfers to his own bookkeeper's book, and each man has to put his initials to it, showing that it has been properly taken off. We have, however, on two or three occasions, discovered that a bookkeeper was careless, and when he had taken off what he thought was his, had checked all the way down the page, so that some meters would not be entered by other bookkeepers. Once or twice we have found a meter out and no record of it, except on the statement-taker's books. The statement-taker has the same record from the books that the bookkeeper takes off; so that at the end of each month the bookkeeper has to show his corrections and changes, while the shop has to do the same, and it must correspond. At the end of the year they have to balance again, and the shop must again balance with the bookkeeper. In that way we have arranged so that we cannot possibly make a mistake hereafter. That will be very readily understood, where we have such large districts as we have in San Francisco. We have a different system of taking statements from the usual system. We have districted the city, and have good statement-takers, men whom we have taken from the shop and made office men of, and have given them office hours. We compel those men to take statements on different days of the month. One day a man may be on Folsom Street, and perhaps on the tenth of the month he comes around to that same district again, and on the eleventh he takes another district; and so on all the way through. We have four or five men that we consider perfectly reliable in every way. We also have a man whom we term a detective, and the statement-takers never know when he is going over a district. We instruct him to take in such and such a district, and he does so, bringing back the book, which we compare with the statement-taker's book; thus checking off and proving that they do their work properly. In addition to that, when the statement-taker brings in his statement every night it goes to the hands of the bill-maker, and they simply put down the statement of this month and that of last taking, when they pass the bills to another bill maker, who makes the subtraction and carries out the amount. Those books go from the hands of the original bill-makers to the bookkeepers, and the bill-maker goes in and compares them with the bookkeeper. In that way we try to keep them as straight as possible, but still we find plenty of mistakes.

Mr. Steinman—A patron did not like the gas furnished him one time, so he by-passed the meter attached to the main and did not pay a cent for gas. He now wants gas and we will not furnish it until he pays for what he has stolen. Another man, a plumber, lived in a house for years, and we never found out, until one of our

stockholders, who rented the house after the plumber left, inquired why his bills were so small. Upon investigation it was found that he was supplied from a by-pass. We have lost several hundred dollars in that way.

Mr. Britton—Our combined business in gas and electric lights in Oakland requires us to have a warehouse. As a foundation for beginning an account we listed every meter that we knew we had in place, to which we added the number of meters in stock and in the shop undergoing repairs. This formed the debit side of our meter ledger. Whenever a meter is taken from the warehouse an order must be presented to the warehouse man by the meter man. The latter gets his orders directly from the office in the shape of a tag, authorizing him to set a meter, and that tag is a check upon the warehouse man, who must not deliver the meter until he has an evidence of authority from the main office. The day after receiving such order he sends in a statement of the number of meters delivered to the meter men, giving the Company number of the meter, the size and a statement of it. On checking up on the following day, that acts as a double check to the proper setting up of the meter, and under the proper statement. Meter men will set a meter and send in a wrong statement, which occasions trouble with consumers, all of which is avoided by this double checking with the warehouse man and the meter man. All "sets" are credits to meter account, and all "take outs" debits. The "take outs" are left at warehouse by the meter man. The meter repairer has to receipt to the warehouse man for every meter that he takes out of the warehouse for repairs, and the warehouse man has to receipt again to the shop whenever he receives a meter that has been repaired. You can see, therefore, there is a positive double check upon the meter; and under that double-checking system there is no possibility of a meter ever getting out of the way. If a meter is destroyed it is properly entered up. I am satisfied that our Company has saved hundreds of dollars by its system, and has the satisfaction of being able to account for every meter purchased. We have a special watch upon meters that do not seem to register. Every month after our bills are made out they are compared by the bookkeeper with the accounts of the previous months, and also with the same month of the previous year. If the meter shows a marked falling off it is at once changed. If it shows a suspicion of falling off a record is made of such meters, with the location and the size, and a test is made with a portable test meter. We test on an average 300 to 500 meters a month, and aim to get around our entire meters in the year, to have every one of them tested. If the portable test meter shows a variation of more than 3 per cent., that meter is at once changed. These lists made out contain the size of the meter, and after the test has been made by the portable test meter, a man goes out and loads up 10 or 12 meters, makes his changes and turns them into the warehouse. Every meter when brought to shop should be thoroughly examined. Our experience has taught us that a meter may, upon a test meter, test all right under small consumption, whereas if you take the crown off and test the diaphragm by a pressure, very often the meter will break upon the least pressure upon the valve, which would probably happen to it if placed under large consumption. By means of our testing we have been able to keep our leakage down, and to that I attribute the fact that it is so small. Our average leakage last year was 6 per cent., which is very small, considering the extent of our mains, and the fact that we have to cross two water courses. We exhaust gas from our Oakland Station, and pump it to Berkley Station, 6 miles away, and to Alameda, 3 miles in an opposite direction, which necessitates a big pressure upon the mains and entails leakage; but from our watchfulness and care over meters we keep the leakage down to a small percentage, notwithstanding. In some winter months our leakage has not exceeded 3 per cent., while our largest leakage last summer was only 8 per cent. I do not think you can invest dollars in any better way than to order portable test meters and test your meters thoroughly, going over them carefully.

Mr. Jones—You are of course familiar with the system of cataloguing books in large libraries, and our system of keeping track of meters in San Francisco is verp similar. It consists of a box containing cards, each card being numbered to correspond with the Company's tag on the meter. That tag belongs to that meter for all time. On that card is a history of the meter, the time it was purchased, the name of the meter, the maker's number of the meter, where it has been set, when set and when removed, and the results of tests which may have been made. The cards are kept in one box to represent the meters in use. They are in series of numbers, so it will be a simple matter to find out the number of meters in use at any given moment of the day. In another box are kept cards of the meters that are in the shop undergoing repairs. In still another box are cards of the meters that are repaired and ready to be set. As meters are condemned the cards are removed to the condemned box, showing the number of meters that are worn out, having been used up; and these cards will, of course, show the history of the meter, the number of places in which it has been used, and probably the amount of gas that has passed. The system is, of course, in its infancy, but when it has been tried we can tell more about it. We hope for great things from it. In speaking of the accounts of gas companies, of course you are all familiar with the accounts necessary in keeping track of material used, purchases, and daily workings of gas companies. Every conscientious gas man keeps a strict account of his company's business. He knows how much gas he is making per pound of coal, how much he is sending out, how much his leakage is, and all matters of that character. I think the Superintendent's note-book is a most valuable one. He should keep a note-book in which he should record even the slightest happening in his every-day work; I think an indexed note-book, from A to Z, is about as convenient as any other kind, and he should use plenty of note-books. He should make off-hand sketches, not trusting to his memory until night to record the workings of the day, but should use his pencil freely, not waiting for pen and ink, even though there are thumb marks or acid stains on his note-book. They are even more valuable then, because they record the workings from hour to hour. With regard to blank forms, a form was put in use by Mr. Crockett about two months ago, which I think most valuable, and which I think was never put in use by any other Company. It was brought about by a case which occurred in San Francisco, in which there was no damage done, but might have been, from carelessness. We have books with a blank form, and a stub for a duplicate, and the forms are printed on thick paper, so that they would not be trodden upon as an advertisement, nor would they be thrown aside carelessly by a householder. Whenever for any reason it becomes necessary to shut off the gas in San Francisco, to change a meter, to cut off a service pipe, or to shut off a main for repairs, the workman in charge of the work takes out his book, which he carries in his pocket and writes to Mr. "A. B." saying, "On such a date the gas will be shut off from your premises, from such an hour to such an hour, for the purpose of such and such repairs. Please see that all of your burners are shut off." That he signs, fills up the stub and makes an entry of it, and he sees that every gas consumer who will be affected by the shutting off of the gas on a street main receives one of these blanks. It is frequently the case that a man who works at night, in taking his rest in the day time may be using a gas stove or a gas grate, and in cutting off the service for the purpose of making repairs, and putting in a new service the gas will go out in his room and the man might possibly be asphyxiated by the disconnection. Under this system there is no danger of that kind, and we find that this form, which has been in use now for some months, works very nicely.

The President—A man is often sent to make repairs and he has to shut off the gas. It may happen that in such a case a gas stove is in use, and the tenant, not thinking, does not turn off the stop-cock. When the repairs are completed the man turns the meter on again, the gas escapes from the gas stove, and thus an accident may happen. To avoid accidents of that kind we commenced sending out these notices, "Please see that all the stop-cocks in your house are turned off, and we will notify you when the gas is turned on again." That we do. I find that in any case of damages you have to bear the responsibility of it, and you have to stand suits. Our Company has in the neighborhood of ten or twelve suits every year. We had a case the other day where some house-movers had gone into a house where the foundation had rotted out, and under the direction of the owner of the house they raised the building up some three feet, and not notifying us, they broke the gas pipe off. The accident occurred late in the afternoon, and some people upstairs were nearly asphyxiated. They brought suit againt us for damages, but we very clearly proved that 15 minutes after being notified that the pipe was broken we sent down and repaired it, and that we were not responsible for the break. On that showing the Judge very properly gave us a non-suit. Another case, which will probably come up very soon for trial, concerned a warehouse located on the side of the street in which we had no gas main at all. On the opposite side of the street, however, we had a main. The warehouse man wanting a hydraulic elevator put in applied to the Spring Valley Water Company for a water service. That Company dug under our pipe, made their excavation and connection and filled in the ground with loose earth and rock. Later on a team ran over our pipe and broke it off, the gas going through the manholes into the warehouse. A workman went in the next morning with a light and an explosion occurred. The man died some two or three years afterwards, and they claimed it was our fault. You must protect yourself in every possible way, so as to prevent the possibility of any accident.

Mr. Britton—When you send a man to a house to change a meter he turns off the stop-cock, puts in the new meter, turns it on and goes away; but it seems to me it is due to the public that when a gas company's man goes to a house to change a gas meter there should be some method adopted for letting the occupants know what is about to be done, either by ringing the bell and informing them, or leaving notice, or some other way. I have notified our men going around with test-meters that when they have to turn off the gas for a while they must inform the people of the fact.

Mr. Osborn—I think the suggestions are very good for small gas companies, and that we of the smaller works should adopt them in a modified form. I do about all this work myself; but I think this Superintendent's hand-book should be kept. Not long since when taking out some meters, by accident I stumbled on one the existence of which I did not know. It had been in the house since 1878, and on looking back for the statement of it on our books at time learned that some 60,000 feet of gas had been consumed by it. On my return home I shall fix up a Superintendent's hand-book, and keep it.

The President—In a large book that I keep I enter everything of interest. In it I have all manner of notations such as tests of meters, cost of different things, diagrams, etc. There will occasionally something arise where you will need it. You may have thought you would never need that information again, but it will come up. Over on the Potrero, in San Francisco, when we were having

trouble with our 24-inch pipe, I found that book of the greatest value. It told of everything that had been done, the nature of the ground, etc., etc. I have kept a book of that kind ever since my earliest connection with the gas business. It is now falling to pieces, but I am going to have it re-bound. You will find that it is something you will always want to refer to.

(On motion of Mr. Stow, a vote of thanks was tendered Mr. Britton.)

Owing to the unavoidable absence of Mr. John Kempf, Jr., of Salt Lake City, Utah, the Secretary read the paper by the former, entitled

FOES TO OUR GAS MAINS AND SERVICE PIPES.

It seems as though it would be almost impossible to say anything new about foes to gas mains and service pipes, so I will only give you an account of a few practical items that happened during the past year, under my observation.

While removing some of our mains and service pipes that had been in use a few years, I noticed most of the service pipes on our principal streets were very much decayed and rusted away at points near the middle of the streets where the street car track crossed them, while further from the tracks, the pipes were in better condition. Last July, while away, my foreman renewed a one-inch service pipe that was pierced with many holes, some of them being quite large. He replaced this old service with a new, one-inch, galvanized pipe. This new service I had taken up during last month, and found that the galvanizing was entirely gone and that the pipe was also badly rusted and scaled off in places, as much as one-twelfth of an inch or more. This service pipe was in use nine months, and I think would have lasted possibly two years at the rate it was decaying away. The location of the above service was opposite the electric street car power house, and no doubt the rapid decay of this pipe, and many others, was due to the electrolytic action caused by the electric street car system.

The street car company here have a 00 wire for their return current, the rails are bonded by a No. 4 wire, and, at intervals, these bonds are connected to the large return wire. The carrying capacity of the return wire and rails is a trifle more than half the amount of current sent out, so nearly half of the return current is lost through other conductors, such as gas and water pipes, to their destruction. Unless some better and more certain way of protecting our mains and service pipes is used, or the street car companies are made to take care of all their current, we will soon be out of the gas business in a number of our cities.

Our streets being 132 feet wide, I have laid new mains on both sides of the streets, as near the curbs and as far from the tracks as possible, hoping that this may help to avoid some of the damage.

A sample of the pipe removed last July (also of the one put in and removed last month) is here and can be seen by the members. Also a piece of service pipe that had been broken and mended in the usual way (with a piece of rag wrapped around it) by the sewer employees.

Here we have almost as dangerous a foe as the electric street car. Not only do the sewer contractors and employees uncover and dig under our pipes and mains, but use them for all purpose possible, such as a step for climbing in and out of the trench; also for a snubbing post and to brace retaining timbers against. Not satisfied with making all use possible of them, they break them nearly off, patch them up with mud and a rag, or some other material equally as good, cover it up, and let the gas company find it at some future time, when a complaint of "no gas" is made, caused by the service pipe or main being trapped by their work.

Another foe permitted to exist by gas companies is factory-coated pipe. Factory-coated pipes usually have a large quantity of pitch, paint, or asphaltum in the lead space of the hubs and on the spigot end. This pitch, paint, or asphaltum keeps the lead away from the iron and leaves room for a large amount of leakage, as the chemical action of the gas eats into the paint. Some will say that we can burn the paint away before using the pipes, or that we can calk the lead tight enough so that no gas can work through between the lead and iron at the joint, but I have found it much better to buy the uncoated pipe and paint it ourselves, leaving four inches of the spigot ends bare, and put no paint on the inside of the pipes to foul the drips, which is often the case with coated pipes. With uncoated pipes there is little chance of getting poor pipes, as you have the uncoated article to examine.

Too often with a view of economy the amount of lead run into the joints is not sufficient, being in some cases not more than one inch. This is economy in first cost, but expensive later on, when in a year or so you find your leakage account rapidly increasing. It is far better to spend a few cents more in lead, and put in from 2½ inches to 3 inches deep, as this, well calked, gives little room for leakage.

Discussion.

The President—This old-new trouble, termed electrolysis, is found to be very dangerous by all gas companies. It affects the gas pipes, rendering them soft and spongy. The reason for this is that electricity decomposes the water into oxygen and hydrogen, and the oxygen attacks the pipes, using them up in that way. In many cities, such as Cleveland, for instance, where electrical propulsion is in general use by the street railway companies, they have time and again found gas pipes eaten out in this way. The matter is attracting the attention of gas men generally, throughout the entire country. The AMERICAN GAS LIGHT JOURNAL, for October 30, 1893, contains a very able article on the subject, which will well repay reading.

Mr. Quilty—San Jose has the pioneer electric roads in this State, and as far as we have been able to ascertain from practical experience, with two electric roads, the greatest danger is where the current returns to the generating station. The damage on the Alameda has been very severe on the Water Company. Our gas mains have been affected very little, because they are quite close to the water mains, and the latter are better conductors. Some gentlemen suggested if we would assist the electricity back from our pipes to the generator, by putting plugs in the mains with metallic connection, the return of the electricity would be facilitated, and a great deal of this trouble would be prevented.

The President—That point is discussed in the paper contained in the AMERICAN GAS LIGHT JOURNAL that I referred to. They experimented with that, and also with connections, and they found the heat was so great there was great danger of fire.

Mr. Quilty—The Water Company in San Jose has had to replace its water mains in front of the power-house two or three times, and the results indicate that the corrosion is due to our foe, electrolysis.

The President—Whenever some member, who has the opportunity of studying out the facts, will write a paper on that subject alone, it will be of very great interest. It is a question that is going to affect us all.

Mr. Eichbaum—Another technical paper says that in Boston they were compelled to run a large cable, of about 1¼ inches diameter, on one side of the street, connecting all their water mains and telephone lines with it, so as to get the return to the dynamo at the power-house. The water pipes suffer severely. That article was more particularly in the interest of the telephone companies, who have their wires enclosed in tubes. It stated that on one street a man actually connected two wires and brought them into his house connecting them with a sewing machine, and the number of volts of current that he got was most astonishing. It also stated that everybody on that street was dispensing with batteries for their door-bells, as they were getting sufficient power from the waste force that came in that way. The paper was profusely illustrated, and it gave a state of things that seems almost impossible. If the telephone companies are going to take it up thoroughly, as seems evident, we will probably get the benefit of it. The damage is unquestionably to the water pipes first, and next to the gas pipes.

Mr. Britton—We have probably more miles of electric railway in Oakland than in any other city of its size in the United States. We are gridironed with electric roads. Our experience is that the main trouble has always been at or near the power-house. I do not think a single instance has ever been cited of damage to cast iron pipes by the electric current beyond 100 yards either side of the power-house. Probably the difficulty is greater in Salt Lake City by reason of the flowing water through the streets, and its seepage through the ground. The ground is naturally very damp in all directions surrounding the gas pipes, and the water and the surrounding damp earth help the current in its endeavor to get back to its source. We have tapped probably 30 places in Oakland within a distance of 20 feet from the rails of the electric company, and so far found no damage whatever. The only evidence of the electric current using pipes for return that we have seen was in the town of Berkeley, at a distance of about 300 feet from the electric road, where our man dug down to tap the pipe, and the electric current knocked him out of the hole. Our pipes cross the electric road about a block further away, and my theory was that the wires rested upon our pipe, and the pipe had carried the leakage. There was a soldered joint in the bond-wire. We have an opposition water company in our city, and their pipes are sometimes within two inches of ours, sometimes right over them. I think they are going to be our preservation, if any trouble of this kind comes. In such an event I think the trouble will come to the water pipe before it reaches the gas pipe. I think, too, the electric current is a "Bogie Man." I think the telephone companies having underground conduits are raising most of this trouble, and endeavoring to make the gas companies parties to it, and I do not think there is anything to be feared, except where the pipes are immediately adjacent to the power-house. Fortunately we had no pipes at or near the power-houses in Oakland. We have had no difficulty so far with this question, with the exception that I speak of. I think no gas man will say that he has had any real difficulty, unless it should be a case like I mentioned in Berkeley, where the bond or return wire comes in very close contact with the rails, the earth being worn away and the copper wire resting upon it. But I think also we should demand that the electric railway companies, in laying their rails, should have the return-wires and bond-wires of the rails kept within proper conditions, and I think that municipal legislation to that effect could be had. The construction of electric roads should be subject to the inspection of an electric inspector.

Mr. Jones—I once had a friend who, upon trying to light the gas, water spurted out to the ceiling. He found that one of his mains had been undermined and broken by a broken water pipe on a hill some distance away, filling an entire gas district with water. Thus the friendly water mains spoken of by Mr. Britton may become a boomerang.

Mr. Decker—As I feel somewhat more at home on the subject of electricity than I do on the subject of gas, I would like to offer some suggestions. Electricity follows the lines of least resistance. No matter how you insulate the rails from the earth there is considerable resistance in them, owing to the fact that they are made

of iron, and also the fact that the rail is laid on the ground. Consequently the loss of current from the rail would be proportional to the difference between the resistance of the rail and the resistance of the ground. The object of electricity is to find its way back by the easiest route, and it will diffuse itself all around in different directions. The water pipe having the greatest area, it will take that route back. All the current reaching out for its conductivity that reaches the water and gas pipes must eventually leave them. It simply follows them on the way back to the generator, using them for that purpose. When it reaches a point that it is possible to leave them it will do so. If it oxidizes it will eat out the pipes. I am surprised that electricians have not come forward and suggested the remedy. The electric current has no bad effect while it is properly conducted. It will not be long, in my opinion, before somebody will suggest a remedy, after the gas and water companies discuss the trouble sufficiently. You will see the day when they will force all electric street car lines to make proper connections through water and gas mains, and in bringing them back with proper connections no circuit is generated, no heat and no oxidization. At the station the current will be taken on again in some manner. In other words, if you compel them to make a proper connection on the water and gas pipes, and lead it back by proper conductors to the works, you will have no oxidization on the pipes at all.

Mr. Quilty—As I understand it, Mr. Decker suggests furnishing a metallic connection from the gas or water mains, to directly opposite the power-house; because the amount of electricity that the main will carry is accumulated along the entire length of the road. The waste of the electricity is along the entire length of the road, and it accumulates along the water or gas mains. There is no necessity of having connection the entire distance. They should simply have a sufficiently strong conductor to carry it along the water and the gas mains, and return it to the dynamo. Such a conductor as that would not be dangerous, because it would simply carry back the negative current. The majority of the negative current would be carried back by the return wire or rails and only the waste portion of the leakage would be felt in the pipes.

Mr. Decker—It would cover it, but still it would be dangerous. You can understand if all the current was in the pipe it would be very foolish for it to leave the pipe to go through a man and go back into the pipe again. In other words, if you conduct all the electricity into the pipes the current will remain in those pipes until it is carried away. Now they are carried all the way through the ground. If I dig a hole in the moist ground and my hands and shoes are moist, I become part of the earth, and the moment I touch the current a part of it leaves the earth and passes through me to the pipe, the very thing it is seeking; and, therefore, you must not only get the return from the pipes, but you must lead your current from the street car track itself. I would suggest that every certain distance there should be a metal conductor connected with the rails, soldered properly and connected with the pipes. If we only connect it to the return end, however, the trouble is that a person will become a conductor when he touches it, and, therefore assist the pipes. You must connect the pipe all the way. We will say it divides itself, and some goes by way of the rails and others by way of the pipes. All that has been accumulated can then be lead away from the pipe near the end, to the generator, and nobody will receive any shock.

Mr. Charles Dickey, of Baltimore, Md.—I am not an electrician, but I read that there is only one cure for electrolysis, and that is by a double trolley. If you are going to address the City Council on the subject of prevention of damage to life or property by shock from electric road wires, the object must be accomplished by having a double trolley wire and return current. You will then have no electrolysis in the ground whatever. That is the only known cure for electrolysis, as I understand the subject today.

(On motion of Mr. Eichbaum the thanks of the Association were tendered to Mr. Kempf for his paper.)

Election of Officers.

Mr. Jones, Chairman of the Committee on Nominations, made the following report:

For President, Mr. C. W. Quilty, of San Jose; for Vice-President, Mr. F. H. Eichbaum, of San Francisco; for Secretary and Treasurer, Mr. John A. Britton, of Oakland; for Board of Directors: Messrs. John Kempf, Jr., of Salt Lake; Charles F. Adams, of Portland; T. R. Parker, of Napa; M. C. Osborn, of Virginia City.

The President then stated that the report of the Committee was before the Association, and asked their pleasure.

Mr. Quilty—I wish to withdraw my name as a candidate for President, not from any desire to shirk the duties of this position, but because I feel that whatever honor there is attached to the position should be conferred upon Mr. Crockett, both on account of his experience and his work as an organizer of this Association.

President Crockett—I am much obliged for Mr. Quilty's kind remarks, but it was at my express wish that my name was not mentioned for President. I shall always take great pleasure in the knowledge that I was the first President of this Association, and I do not mean by that that I shall not hereafter be a worker. For the reasons stated I shall decline to be nominated again for President.

Mr. Jones—As Chairman of this Committee, I will say Mr. Crockett stated to the Committee he thought we should follow the example of other Associations of changing the President every year. You must give the Nominating Committee credit for being able to select a good man for the office of President of the Association. They considered the matter and discussed it at some length, finally deciding that Mr. Quilty, of San Jose, is the proper man, and I hope he will accept the nomination.

Mr. Eichbaum—Mr. President, there are times when a person should bow to the wish of the majority. In my opinion it is not only desirable, but it is necessary that Mr. Crockett should continue as President for another year. I would ask him if he would not accept it, if the Association unanimously desired him to serve again. I would like to offer this resolution, that in view of the circumstances it is the unanimous wish of this Association that Mr. Crockett accept this office for another year.

President Crockett—I have other reasons outside of those stated, why I could not accept the Presidency for another year. I have been for two or three years very actively engaged finishing up the new works of the San Francisco Gas Company, and am now hopeful of getting away next year for a trip to Europe. Mr. Quilty is a very energetic gentleman, and I am sure he will do all that anybody can. He is perfectly able to fill the position. I shall at all times feel like doing all that I can for the Association, whether in office or in the ranks.

Mr. Quilty—San Francisco is the metropolis of the Coast, and I would suggest that somebody from either San Francisco or Oakland should be selected for that position. I think that Mr. Eichbaum, of San Francisco, or some one from Oakland, would be a great deal better than myself.

The President—I think that that matter has been considered by the Committee.

Mr. Jones—Among other things, the questioned was considered geographically. Considering that our first President came from San Francisco, we thought that city should not again be called on to fill the office, and yet the Committee desired to do all honor to Mr. Eichbaum.

Mr. Eichbaum—And for that very reason I would not have accepted the nomination, had I been selected.

(On the motion being put by the President, the report of the Committee was unanimously adopted, and the officers therein stated were duly elected by ballot for the ensuing year.)

Next Place of Meeting.

The report of the Committee on selection of the next meeting place was here presented by its Chairman, Mr. Parker, recommending that the next meeting be held in the city of San Francisco. The President stated that before putting the question there was a communication from Los Angeles, conveying an invitation of W. B. Cline, President of the Los Angeles Lighting Company, to the Association, to hold its next session in that city, which communication was read by the Secretary.

Mr. Clements—The report of the Committee was based upon the proposition of holding the meeting where there would be the greatest number of persons present. I notice the absence of many faces at this meeting that I saw at the last session. Sometimes members have business that they desire to attend to in San Francisco, and it was thought it would suit all to hold the meeting there.

Mr. Quilty—I think that difficulty could be solved by suggesting the city of San Jose, where we have several trains coming to and fro each day. On the part of the Gas and Electric Power Company, of San Jose, I invite this Society to hold its next session at the city of San Jose.

The President—In the East the New England Association has made one place the point at which its sessions are all held. Is it not better to establish a permanent place, say like San Francisco, where the sessions will always be held?

(On motion of Mr. Osborn, of Virginia City, the report of the Committee, recommending the city of San Francisco as the next place of meeting, was unanimously adopted.

Mr. Osborn also moved that the thanks of the Association be tendered to the Los Angeles Lighting Company for its invitation to hold the next session in that city, which motion was duly seconded and carried unanimously.)

Letters of Regret.

Letters of regret were here read from W. M. Milsted, President of the American Meter Company, and from Mr. J. L. Hallett, the Vice-President of the Association (dated at South Hyannis, Mass.), C. E. Burrows, of Walla Walla, Wash., J. Kempf Jr., of Salt Lake City, W. B. Cline, of Los Angeles, and others.

The Secretary then stated that, at the last meeting, resolutions were passed by the Society upon the death of P. E. De Mill; that he was instructed to forward a copy of said resolutions, properly engrossed, to Mrs. A. A. Moore, of Detroit, Mich.; that he had forwarded said resolutions as directed, and that they were returned to him from the Dead Letter Office.

THE QUESTION-BOX.

Question No. 1: "What has been the year's experience with Japanese coals?"

Mr. Gregory—With me it has produced an immense amount of sulphur and ropy substance, so as to stop up the hydraulic mains. We use a regenerative bench.

Mr. Eichbaum—Having had two years' experience with it, I can briefly state what we have done with it. We found that by using not more than one-third of that coal, and mixing it with either Greta or Wallsend, that we have had excellent returns, both in

candle power and in coke, without any trouble whatever from stopped stand pipes, or trouble of any sort. I would also state that we had a small fire in it, which I very much dreaded, because we once had a very bad fire in Wallsend coal. One morning we discovered smoke coming out of the centre of a wall and we started to dig it out. By half past ten o'clock four or five men dug out the entire portion that was heated, which was not larger than your hat. It was not more than three feet from the surface of the pile, and below that it was as cold as ever. Since then we have had ventilating rods put in all over the piles, and we have had them examined, and the result is that we have found that it is probably colder than any other kind of coal. We have had fire in South-Prairie, in Wallsend, and in Greta. Our principal coal was piled up about 25 feet high, and we had a large gap about 25 feet wide. In order to get from that to the pile of Japanese coal, I had to bridge across a temporary trestle work, and dump off that. The trestle work did not quite reach the pile, and of course we dumped directly off the end, about 25 or 26 feet. It was in that pile, where it was packed by the impact or drop, and also by running along the pile that was narrow, that that fire took place, in my opinion. I judge, therefore, that it is a dangerous thing to drop coal on a direct drop. When you are dropping off a coal pile at an angle of 45 degrees, it will drop that way; but to drop directly down is another thing, and I think the danger of coal fires is where coal drops that way. The coal in the Scottish Hills that took fire about three years ago, took fire in the same position. The fire that we had with the Wallsend coal was where we had made that sheer drop before.

The President—There are two kinds of Japanese coal; one is the Muke and the other Yubarri. We must not confound the two coals. I know some gentlemen here have had experience with Yubarri coal, which will not apply to Muke coal.

Mr. Eichbaum—My remarks applied to the Muke coal.

Mr. Eastland, of Oakland—Our experience with the Muke coal was that it was something like Nanaimo coal. It was extremely hard to get rid of the sulphur; so much so that having used 40 per cent. we had to drop to about 15 since which time we have had no trouble with it. It makes a good coke and yields a good candle power. It is certainly very hard to purify.

Mr. Gregory—Using one-third is not a fair test for the coal. When you undertake to run works with Muke coal, I think all gas works will get stopped up with it.

Mr. Jones—I have here tests of several gas coals, and among them is Greta. An excellent quality of Greta coal tested some months ago, under the most favorable conditions, with a full depth regenerative furnace, which should be considered, in considering this matter, gave the following results:

Greta	coal,	yield per lb.	5.25	; average candle power		16.63	candles.
Muke	"	"	6.01	; "	"	16.01	"
Yubarri	"	"	5.67	; "	"	17.97	"

These coals should yield more candle power, however, and a less yield in the volume of gas. It will be found in gas works generally, that by using from 25 to 50 per cent. Yubarri or Muke, it is not necessary to use any enricher, where it is not desired to carry the candle power over 18¼. The San Francisco Gas Light Company is now using 50 per cent. Japanese coal, mixed with good standard coal, Wallsend and Greta. There was a great deal of difficulty at first with the large amount of fine carbon—disintegrated coke you might call it—which flew out into the retort house and affected the workmen. That was overcome, however, by the workmen themselves. They have very little trouble at the Potrero Station today. In the matter of purification, if a company is using lime to purify the gas, I think it would be disadvantageous to use the Japanese coal. If we, in San Francisco, had even eight boxes to change per day, I think it would be just as well to save the enricher, and use Japanese coals.

The President—By careful handling and experimenting I think nobody will have any trouble with Japanase coal, except by way of purification.

Question No. 2: "Has any person here present found it difficult to keep up the heat in a Klœnne-Bredel bench?"

Mr. Gregory—I offered that question, in case any one desired any information with regard to it. I will simply say that there does not seem to be quite room enough in the arch. There are different openings through the arch and after the bench has been run a considerable length of time, a lava-formation will develop in those openings which stop up the bench. If the bench is closed down for any purpose, some one should go in there and see that those openings are made as wide as they were in the first place. If it be found that the dampers or primary opening do not heat up any more, it will be found by examination that the arches have banked up, and the air coming in from the outside would carry nothing with it. When the clinker falls down it forms steam, and the expansive force combined with the force of the air drives the ashes back and stops it up. This is the reason why it is impossible to keep up heat. There are what I would call longitudinal chambers in the bench. The latitudinal chambers cannot be gotten at, and if a steam nozzle is run into the longitudinal chambers it will produce a good effect and clean them out thoroughly. The mouthpieces weigh 300 or 400 pounds. In keeping up the heat the mouthpieces will glow with the coal, and they will begin to move and come off. I used a support similar to a jack-screw, made out of 1¼ inch iron, and set the end bolt on top of that, to support the mouthpiece. It held the mouthpieces in their places. They will come sideways and crawl along, and it is not sufficient to merely support them. I, therefore, put a jackscrew through in front, in order to prevent their springing out. I placed it between the front and the mouthpiece, but they cannot be held in their places without an outside support. I have been running these benches nearly three years. They began to travel as soon as the first bench had time to burn the bolts off. We did not notice it until we discovered that one of them was tipping down, and then we took the entire mouthpiece off and put it back again, and if supported in the way I have described it will hold, in taking it off and putting it back. I put straps on the stand pipes, and fastened them in also.

Question No. 3: "Can we gas men do anything toward having coal tar manufactured into dyes, sugar, carbolic acid, or other useful products that will create a healthy market for the raw material?"

Mr. Eichbaum—The quantity of coal tar made on this Coast grows less each year, and from my experience I would say that we can get rid of all we make in San Francisco.

Mr. Clements—It may be true of San Francisco, while it will not be so of all small gas works. In our place we have more tar than we know what to do with.

The President—I think Mr. Greer, of the Pacific Ammonia and Chemical Works, will be able to enlighten us on that subject.

Mr. Greer then opened the discussion as follows:

If you can prove that there is anything in working up coal tar, I will agree to go in the business. As a representative of the Pacific Ammonia and Chemical Company, I may possibly be permitted to discuss with you the subject of liquor—gas liquor, I mean. (Laughter.) Probably most of you are aware that we have established in San Francisco a plant for the manufacture of aqua ammonia, and also a plant for the manufacture of anhydrous ammonia, and have contracted with the San Francisco Gas Light Company for their entire output of gas liquor. In the past year the coal carbonization of this Company has been so much reduced, owing to the completion and operation of their new water gas plant at Black Point, that it is very probable that in the near future we will have to increase our supply of raw material by bringing it from other sources, in which case the gas liquor, or ammoniacal liquor, to speak more properly, will prove quite a source of revenue to the smaller gas companies of the Coast, if it is put in marketable shape. I will state to you briefly how this can best be accomplished. It is, first, necessary that you make provision for collecting all of the ammoniacal liquor that is formed in the hydraulic main, condensers, and scrubber, by making pipe connections to a specially prepared liquor well; the tar can be separated from the liquor in this well, or can be separated before it reaches it. The ammoniacal liquor collected in this way will range from three ounces to six ounces in strength, or 1½ degrees to 3 degrees Twaddle. To ship it profitably it is necessary to increase its strength. In other words, to concentrate it. We have a simple form of concentration which can be operated at small expense, and will work weak liquor up to 60 ounces, which is the proper strength for shipment. Gas works carbonizing 1,000 tons of coal and over annually, will find it very remunerative to work up their ammoniacal liquor in this way, provided of course that they have a ready market for their product. We are not ready at present to make contract for concentrated ammoniacal liquor; however, I can assure you that we will be at no very distant date, so that gas companies along this Coast who will furnish us with concentrated liquor will make from 25 per cent. to 150 per cent. annually on their investment.

Question No. 4: "How long a time is a consumer's meter considered reliable under favorable conditions?"

Mr. Jones—I recently received the report of the Massachusetts State Inspector of Gas Meters in which I find a statement that is authoritative on this question. He says that "Meters set in dry places, where the temperature is moderate and equable, need attention in perhaps only five or six years, and will generally remain accurate much longer; but if the places chosen are near or over furnaces or steam boilers or other unsuitable places, more frequent examination is necessary. The quality of the gas supplied through the meter has an important bearing also. A large percentage of ammonia, or unfixed oil vapor, may affect the registration by combining with the oil used to render the older diaphragms sound and pliable, and also by corroding the moving metal parts. Sulphureted hydrogen and tarry matter in the gas tends to make the meter work hard."

Mr. Clements—I propounded that question, and Mr. Jones has given us almost a complete answer.

Mr. Dickey—I think the question resolves itself into what is called the life of a gas meter. If a gas consumer will see how long it has lasted, he can strike a good average. It depends altogether upon the condition. Ten or 20 years ago, when meters were not set by the Gas Company, there was no care exercised in that respect. Meters were sometimes right near furnaces. It affects the meter particularly when you set it near water. In the east, during 8 or 10 years, our people had exclusively used coal gas, and then began making water gas and enriching it, and the water gas has dried out the natural qualities of oil in the diaphragms, and in many cases they have been obliged to go all over town and reconstruct the meters or put in new ones. I have seen some of them that were as hard as a rock. The people cannot realize the mechanism of a meter, and they should be placed in the most favorable positions.

Mr. Britton—We made coal gas for a good many years, and we had no trouble with our meters. Mr. Eastland and myself repaired all our meters at that time. When we introduced oil gas, the trouble came, and the meters increased in our shop in great numbers. As I stated in my paper, when meters are put in damp

places there is always trouble. We all know that meters are not used very much in offices, and sustain an even greater loss than those that are constantly in active service. Even with the oil gas, we have no more trouble in office meters than we formerly had when making coal gas. I speak of meters that do not register more than 200 or 300 feet a month. We have had such meters in existence that have not been changed in over 10 years, and upon testing they have proven to be in as good condition as when they were put in, because of being set in dry places. I think gas people should stand together in respect of the placing of meters. If we work in that way with architects, contractors and gas fitters, we will save much money in a year, in the way of repairs.

Mr. Eichbaum—I would like to briefly give my experience, which has been this: When a company changes from coal gas to water gas exclusively, in any shape or form, it will experience trouble for a while, because the oil gas will take away the oils that permeated the diaphragm when it was in use for coal gas. After the diaphragms are put in new, there is no further trouble from oils belonging to the mixed gas. My experience is that a meter running with a mixture of coal and water gas lives certainly 10 or 12 years.

The President—I think the Sixth question, "Are two or three diaphragm meters preferable," should be taken up in this connection. We have all been running in ruts in ordering three diaphragm meters, when two diaphragm meters are sufficient besides being cheaper. When Mr. Dickey was present with us a year ago he gave me some very good points on the question of the slide-valve and the rotary-valve. Will Mr. Dickey explain that to us.

Mr. Dickey—That is a hard thing to explain. Three-diaphragm meters have been made and used for a number of years back, and the main reason why they were discontinued was on account of the rotary valve. Aside from that, the tendency of the three-valve meter is to leak, in any one of the diaphragms. If that leak is not very large the meter will continue working without showing the leak, and the consequent loss of gas, as quickly as a two diaphragm meter. With the regular Glover slide-valve meter, wearing is impossible, as everything that is inclosed in the meter is of a white metal, and therefore indestructible. With the three-valve meter you cannot use anything but small brass wires. For these reasons all the New York gas companies, and in fact companies all over the United States, abandoned the three-diaphragm rotary meter some years ago. When the meter companies now get in a lot of those meters for repairs they are simply thrown into the scrap pile, because they are really not worth repairing. In addition to that, the expense is so great that the gas companies are glad to get rid of them.

The President—The San Francisco Company has a man in its employ a good many years, who thoroughly understands the meter. He was very much prejudiced against the two-diaphragm meter, and, being a man who had spent his lifetime in repairing meters, we allowed him to influence our judgment. We are now, however, going to use the two-diaphragm meters. In changing to the two-diaphragm meters, I had to agree with the American Meter Company, from whom we had been purchasing our meters, to take all the three-diaphragm meters off their hands, they having made them in anticipation of our wants, so that they could supply us when suddenly called upon. After we have used those three-diaphragm meters up, we will then use only the two-diaphragm meters.

Mr. Stow—I understand that the man referred to by the President claimed that in the East the two-diaphragm meters could be returned to a factory close at hand for repairs; but that when the meters were repaired at the gas works, as we are compelled to do on this Coast, the repairs cannot be so economically made.

Question No. 6: "What per cent of leakage is attributable to defective meters, and what is the best plan to reduce same?"

The President said he thought this question had been fully answered, and then went on to say: The hour for the banquet in the evening has been changed, from nine o'clock to half past seven. Before retiring I would like to introduce Mr. Quilty, your new President. I feel sure the interests of the Pacific Coast Gas Association will be left in the very best of hands, in that its affairs will be taken charge of by one who will look after its interests in every particular. It affords me great pleasure to present to you your new President, Mr. Quilty.

Mr. Quilty—Gentlemen of the Association: I thank you feelingly, and from my heart, for the honor that you have conferred upon me. It is entirely unexpected, and, to a certain extent, unmerited, and I feel that the mantle of this office has been taken from able and worthy shoulders. While I may not succeed in fulfilling the duties of the office, and being the efficient officer that Mr. Crockett has been, still I trust I may continue to do something to preserve the officicncy of the Association, and carry out its work and designs. I feel quite thankful that my friend, Mr. Britton, has been chosen to assist me. This organization is in its infancy, and the gas and light business is in its infancy on this Coast. It is as yet almost undeveloped, except in San Francisco, where, by the splendid work of the San Francisco Gas Light Company, as shown through the efforts of its President, Mr. Crockett, seconded by the able efforts of Mr. Jones, who is one of the ablest gas engineers on this Coast, great progress has been made. When I expressed a hesitancy at being placed in this position, it was with a desire that this Association should be placed in a position for more and better work, and I thought Mr. Crockett's declination might jeopardize the continuation of the Association. I will say that I will do everything to the utmost of my ability throughout the year to advance the interests of this Society and to make it equal to our sister organizations beyond the Rocky Mountains, if that be possible. In doing so I know I can rely upon the efficient asssitance of our worthy Secretary, and of each and every member. I wish to state the duties of the Secretary are rather onerous, and he has much to do with the holding of the entire organization together. I think, therefore, he should be compensated for his services, and in closing I would suggest that some moderate compensation be allowed him for the same. I again thank you for the honor you have conferred upon me, and I trust that when I resign my office this organization will have advanced as it has so ably done under Mr. Crockett's administration.

Mr. Britton—While I appreciate the kind remarks of Mr. Quilty, I desire to say that I could not for a moment think of receiving any compensation for my services. I want to do it with the feeling that I am doing it for the interest of this Association, which I desire to go forward. I am perfectly willing to devote my time at this and at any future meetings. I am a gas man, from my toes up. I have been associated with the Gas Company that I represent for 20 years. I was almost brought up on top of a holder, and cradled in a gas main. I, therefore, hope you gentlemen will not carry out any such project as that suggested by Mr. Quilty.

Mr. Eichbaum—I desire to move the thanks of this Association to Mr. Britton for the very able and efficient services rendered by him during the past year.

The President—You have taken the words out of my mouth. I have seen the work that Mr. Britton has done, and he has attended to all the details. He has taken two or three trips to Sacramento in connection with this meeting, and I think you will see the further effects of his work this evening. Under all the circumstances I think this Asoclation should not fail to express a vote of thanks to Mr. Britton. [Adopted.]

Mr. Decker—I desire to offer a vote of thanks to our retiring President. I have never before had the pleasure of sitting in a society composed of men of such experience and intelligence. If I was not entirely a gas man this morning, after to-day's experience I feel I am almost entirely absorbed in the question of gas, from being here to-day listening to the President, and to the thoughts he has suggested. In coming into the Society for the first time to-day, I quickly saw that the President and the Secretary were the ground workers of this institution, and the thoughts here acquired will be brighter in my mind. If the feelings of everyone are the same as mine, I am sure that by next year every gas man will feel that this Association should grow. I, therefore, move a vote of thanks to our retiring President for the able and efficient manner in which he has presided during the past year. [Adopted.]

On motion, the convention then adjourned until evening, at which time they were to attend the banquet.

EVENING SESSION.

At 7:30 P. M. the members and guests all assembled at the Mason Fauré, where an excellent menu was thoroughly discussed, and for the time being, "electrolysis" and kindred cares were drowned in the shouts of good fellowship and success to the Pacific Coast Gas Association. Appropriate toasts were made and responded to under the direction of that prince of toast masters, Mr. Jos. B. Crockett.

Second Day, May 16.

The members all assembled at the depot in Sacramento at eight o'clock, and took the special train for Folsom. After a short run over the plains of Sacramento County, and into the foothills adjacent thereto, Folsom was reached in due time. Carriages were waiting at the depot to convey the members to the State Prison, where they were received and welcomed by Warden Aull. An inspection was then made of the institution, also the celebrated dam of the Folsom Water Power Company, and the great work on the same, a work second only to the development of water power at Niagara Falls, designed to furnish Sacramento (22 miles distant) with electricity, and after two hours very pleasantly spent the return was made to Sacramento. At the gas stove store of the Capital Gas Company, a lunch, prepared entirely on gas stoves, was served, demonstrating the efficiency and economy of gas stoves in a practical way. At the close of the lunch, President Quilty called the Association to order, when a vote of thanks was unanimously tendered to Warden Charles A. Aull, of Folsom, to Mayor Steinman, of Sacramento, and the Capital Gas Company, for courtesies extended; also to Mr. Boardman, of the firm of Wiester & Company, of San Francisco, for the sumptuous lunch.

The Secretary reported that the following dispatch and answer had been sent to and received from The Western Gas Association, meeting at Cleveland, Ohio:

Sacramento, May 15, 1894.

A. W. Littleton, Cleveland, Ohio: The infant, The Pacific Coast Gas Association meeting to-day, sends greeting to the Western Gas Association. John A. Britton, Secretary.

(Answer.)

Cleveland, O., May 16, 1894.

John A. Britton, Sacramento, Cal.: We heartily thank you for your kind greetings and wish the lusty infant a long life of happiness and prosperity. A. W. Littleton, Secretary.

The reading of dispatch was received with loud applause, and the Association adjourned.

Electricity as a Source of Light.

The *Journal of Gas Lighting* notes that the municipal authorities of Dresden have from 1887 to the present day had under consideration various schemes for lighting the town by electricity. In November, 1892, powers were applied for to carry out one of the schemes; and the Administrative Committee of the Town Council were requested to advise on the subject. Herr Hartwig, a member of the Council, was deputed to compile the report of the Committee. Recognizing the general prevalence of ignorance on electrical matters, and the dearth of information on the working of existing lighting stations, he conceived the project of issuing the report to the general pub'ic; and, with the consent of the Council, he has now published the first installation.

Under the title of "Electricity as a Source of Light and Power," the compilation forms a popular treatise on electricity and its application; and, according to the compiler, it provides the requisite data to enable anyone to form an independent opinion on electrical questions. The work practically is in three sections; the first being intended to serve as an introduction to electrical science, especially elucidating the mysteries of the application of the electric current to lighting purposes. Of the ultimate value of a study of this first section of the book to a mind totally unversed in the science, we are not over sanguine; and though without it the remainder of the book would be sealed to the general public, we are skeptical of the benefit accruing to one who travels by such a "Royal Road" to a knowledge of electricity. Pursuant to the avowed purpose of the work, electrical phenomena that do not bear directly on the commercial production of light and power meet with no adequate treatment, and a clear apprehension of the true relative position of the more important facts of the science is denied to the reader. The presentation of isolated facts to be accepted without question or explanation, is not a reassuring feature of the early pages of the book; and we are fain to believe that some indication of their correlation and evolution would be welcomed by those for whom it is designed. The voltaic cell is dismissed in a few lines; but the secondary batteries now so much employed for portable lights, which threaten to drive the antiquated and cumbrous safety lamp from the precincts of gas works, receive recognition later in the book, though the author deems explanation of their action unnecessary. It may be prejudice due to academic training that prompts us to look for a definition of "potential" early in the pages of an electrical treatise. But the most "practical" of modern electricians will hardly be prepared to dispense with it altogether, and we feel convinced that Herr Hartwig would have found the elucidation of phenomena easier had he availed himself of it and other terms of electrical theory. We would advise the learner not to be content with the general knowledge of electricity to be acquired by a perusal of the first section of this work, but to read in conjunction with it (or in its stead) some sound elementary text book of the science. He may then safely trust himself to a study of the portions of Herr Hartwig's book which are intimately concerned with electric lighting, and he will the better appreciate them by reason of his *excursus* in other directions.

Having expressed disapproval of the author's method of exposition of the primary facts of electricity, we have nothing but praise to offer for the care he has bestowed on the work. He started on his quest after the most economical system of town electric lighting, in an unbiased spirit; and he maintained the same even when facts wholly unsavory to the advocates of electric lighting in general presented themselves. Of this, we have ample evidence scattered throughout the second and chief section of the book, which deals with the cost of different methods of working for the electric lighting of towns. The data here are chiefly derived from the returns of important towns on the Continent. But, as if to throw into greater relief the costliness of electricity, Herr Hartwig devotes an appendix of more than 80 pages—which may be regarded as the third section of the book—to that modern triumph of economy in lighting, the incandescent gas light. That a chapter on gas lighting should find a place in a report ostensibly on the various methods of electric lighting is a splendid testimony to the claims to consideration of the older method of illumination; and we can desire no more than that the book before us may fall into the hands of all municipal authorities contemplating the adoption or extension of the electric system, and that they will not fail to peruse the appendix as well as the body of the work.

The practical details of electric lighting are well treated, and errors are not obvious. The principle of the incandescent light—the 2,000 times greater specific resistance of carbon than of copper causing heating of the carbon filament—is well explained; and the popular expression "burns," as applied to the glowing of these lamps, is deservedly condemned, since combustion is impossible in the vacuous globe, and moreover the filament is not consumed. The distinction between continuous and alternating currents is then drawn, and the equal consumption of the carbons of the arc under the latter is pointed out among the advantages it offers, as well as the simplicity of its generation, though it will not serve for electrolytic decompositions. Side by side we find the advantages and disadvantages of the continuous and alternating current systems tabulated.

The danger to life of high tension currents is shown by a melancholy record of deaths in the United States and elsewhere, and a number of fires due to sudden heating of the conductors are mentioned, as well as some at the generating stations from other causes. The regulations imposed by insurance companies are next quoted, and the evil effects of the too glaring light on the sight are instanced. Then follow explanations of the practical units used by electricians—the ampere the unit of current, and the volt the unit of electromotive force; and the volt ampere or watt. But we do not notice that their relation to the absolute units is given. Commutators are treated with much lucidity, and the methods adopted for the measurement of electrical energy are described. In Cologne, 100 watt hours cost 8 pfennigs, and a 16 candle incandescent lamp is estimated to consume 55 watts per hour. Hence the cost of one such lamp per hour is 4.4 pfennigs, or almost exactly 1 cent. But, in addition, a meter rent of $3 per annum has to be paid for the smallest equipment of ten 16 candle lamps; and, moreover, the meter requires testing at short intervals.

Herr Hartwig then proceeds to enumerate the more important electrical machines, and he gives illustrations of the methods of arriving at the thickness of conductor required for conveying currents of given strength over stated distances, and the loss of electromotive force entailed. Afterwards he discusses other details of distribution. The application of electrical energy is considered; and the relative merits of the arc and incandescent lights for various purposes are enumerated at length. Among the cautions with regard to even the incandescent light, we notice that contact of the globe with inflammable material—such as paper or curtains—is to be avoided; though the fact that such substances are easily ignited by this contact is not sufficiently recognized. In a typical instance, the author finds that light is six times cheaper by the arc than by the incandescent system of illumination. The question of continuous or alternating currents is a vexed one; but, on a majority of advantages, the palm is awarded to the continuous current for most purposes.

Large central stations are deprecated on the score of their greater costliness of working than a number of small ones; and it is shown that electrical supply companies using large central stations cannot compete for cheapness with large private installations. In all these cases the conclusions are arrived at by comparisons of the actual figures obtained in working in several typical instances; and many of the results are tabulated for reference in a manner that reflects infinite credit on the compiler for the industry and care expended. Among other places, we notice Halle, Magdeburg, Dantzic, Hamburg, Leipsic, Chemnitz and Frankfort-on the-Main are treated; and particulars of the electrical installations there are given.

One point with regard to electric lighting which is often forgotten is the indispensableness of gas or some other means of illumination to be kept in reserve; and we are glad to see Herr Hartwig allude to it. The portion of the book strictly devoted to electricity concludes with a useful abstract of the contents of the early chapters. We then come to the before-mentioned appendix on the incandescent gas light. Our readers are well acquainted with the economy of incandescent gas lighting, and the principles involved; and the composition of the mantle has often been laid before them in the columns of the *Journal*. To the exhaustive treatment of the subject in the book before us we need not refer, except to commend the chapter to the attention of those who are hesitating between gas and electricity. Herr Hartwig draws the following conclusions with regard to incandescent lighting by gas: The mantles, on an average, emit 3½ times as much light as the 16-candle incandescent electric lamps during the period of their efficiency; and the life of a mantle is virtually co-extensive with that of an electric glow lamp. The incandescent gas light develops 3½ times the heat of the electric light, but only one fifth that of an ordinary gas light. The electric light supplied from central stations costs six times as much as the incandescent gas light; and the cost of its installation in a house is seven to eight times that of installing the latter system of illumination.

The Structure and Chemistry of the Cyanogen Flame.

Professor Smithells, of Leeds, lately read a paper on this subject before the Chemical Society, London. The association of peach blossom and cyanogen as descriptive of the color of the flame is a combination which, once learned, we never forget. The composite character of the flame is especially well seen when the cyanogen is burnt in the tube apparatus devised by Professor Smithells, where the separation of the flame into "cone" and "mantle," each burning some inches from the other, is readily effected. It was demonstrated that the colors of the flames vary according to the proportion of air that is present at the moment of combustion. With a little air the cone burns with its characteristic rosy flush, while the outer flame or mantle is blue, shading off to crimson. Excess of air causes the mantle to burn with a greenish-yellow tint, derived from the oxides of nitrogen, produced, it is believed, by the roasting the air gets, and not by its actual combustion. The gases produced by the combustion of cyanogen in air or oxygen are CO, CO_2, CN, N, and oxides of nitrogen. Considerable difficulty arises in separating and

estimating these gases. For instance, the CN and CO_2 are aspirated together into a stoppered funnel containing barium hydrate, insoluble barium carbonate is precipitated, and by calculation gives the CO_2, while the cyanogen is converted into soluble cyanate and cyanide of barium, which are present in the clear filtrate from the carbonate. In addition to the apparatus for displaying the properties of the cyanogen flame itself, similar sets were provided for showing the effect of burning salts of copper, lithium, and gold. These salts were introduced by spraying solutions of the respective chlorides into the flame. The green color characteristic of the volatilization of copper appeared in the mantle. The brilliant appearance of lithium vapor is imparted to both cone and mantle, but a mixture of lithium and copper gives a meretricious effect. The copper may be seen in the upper flame, but it is often masked by the lithium, which colors the lower flame in every case, and when it masks the copper the upper flame becomes scarlet as well. A bead of sodium burnt in the cyanogen cone is completely masked, and it was shown that copper chloride, when heated in an ordinary Bunsen flame, yields three different zones of color, corresponding to metallic copper, copper oxide, and copper chloride. The source of the cyanogen is mercuric cyanide—a costly salt when gallons of the gas are needed.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

ANOTHER Company has reached the dollar mark, the latest to name that figure being the Springfield (Ills.) Gas Light Company, whose Directors early this month unanimously adopted the following resolutions:

"*Resolved*, That the President be requested to withdraw any and all propositions made by their Company to the Mayor, the City Council, or any committee thereof, and now pending, for furnishing gas to private consumers.

"*Resolved*, That the Secretary be instructed to render all bills for gas consumed by meter during the month of May, and until further notice, at the rate of $1.20 per 1,000 cubic feet, with a discount of 20 cents per 1,000 cubic feet on all bills paid not later than the 10th of the month in which they are presented, making the net price $1 per 1,000 cubic feet."

The bills for May were rendered on June 4th at the old rate, but all who settled their accounts by the 10th of the month were granted the new discount. The Messrs. Ridgely and Odiorne were always consistent champions of low selling rates, and as a result the Company has prospered. The present cut is equal to a concession of 33⅓ per cent. from the former schedule, and, all the circumstances considered, we are not far wide of the truth in saying that Springfield is enjoying an excellent gas service at the cheapest rate in the West. The Company proposes to extend the use of gas for purposes other than lighting in Springfield, and to that end offers to sell gas ranges at net cost, to set them up without charge, and also agrees, in the case of a new consumer, to run 80 feet of service pipe without making charge therefor.

THE Kerr Murray Manufacturing Company reports a brisk business, with a promising outlook for the immediate future, and as evidence that all this is so we submit the following contracts on which the Company is engaged: For the Jefferson City Gas Light Company, of New Orleans, La., a telescopic gasholder, in steel tank, rated to store 100,000 cubic feet, and a washer of 200,000 cubic feet daily capacity, with the necessary bye-pass valves and connections; for the Shelbyville (Ind.) Gas Light Company, one set of water gas apparatus, consisting of cupola, seal boxes, connections, fittings, valves, etc.; for the Peoples Power Company, of Moline, Ills., an iron roof for retort house, multitubular condensers and washers, of 250,000 cubic feet capacity, and one set of 12 ft. by 12 ft. by 4 ft. purifying boxes, with 12-inch center seal; for the Massillon (O.) Light, Heat and Power Company, one set of 12 feet by 16 feet by 4 feet purifying boxes, with 12 inch 4-way valves and connections; for the Port Huron (Mich.) Gas Light Company, a gasholder of 25,000 cubic feet capacity, with the necessary columns and girders; for the Marion (O.) Gas Light Company, a gasholder 50 feet in diameter, with lattice columns and girders; for the Altoona (Pa.) Gas Company, several carloads of 12 inch, 16 inch and 20 inch valves and connections; for the Mobile (Ala.) Gas Light and Coke Company, a 60 feet diameter gasholder; for the Nebraska City (Neb.) Gas Company, a gasholder of 25,000 cubic feet capacity; also, castings for coal gas benches for Knoxville, Tenn., Michigan City, Ind., Youngstown, O., Lansing, Mich., Princeton, Ills., and Davenport, Ia., together with sundry orders for street main specials, valves and fittings of all classes, for both coal and water gas.

THE proprietors of the Hudson County Gas Light Company, of Hoboken, N. J., have ordered a reduction in the selling rate of 25 cents per 1,000 cubic feet, or from $1.75 gross to $1.50 gross—another evidence of President Dodd's business ways and Superintendent Shippen's clever and capable management.

THE Western Gas Construction Company, of Fort Wayne, Ind., has been awarded the contract, complete, for the works of the Nanticoke (Pa.) Gas Company, the incorporation of which Company was recently noted in our columns. The contract, which was secured in face of very active bidding, includes the water gas apparatus, purifiers, meter, holder, street governor, and all the street main specials, valves and valve boxes required for the main system, which will be limited for the present to something over four miles.

AT the annual meeting of the Toledo (Ohio) Gas Light and Coke Company the officers chosen were: Directors, S. M. Young, Charles Faben, Jr., A. L. Backus, John Cummings, Joel Floyd and Thomas H. Tracy; President, S. M. Young; Vice-President, A. L. Backus; Secretary, Thomas Biddle; Superintendent, Chas. R. Faben, Jr.; Assistant Secretary, George Wheeler.

THE Board of Arbitrators to adjust the price of gas in Minneapolis, Minn., will begin to take testimony to day.

THE Portsmouth (Ohio) Gas and Electric Company is increasing its purifying capacity by the addition of a "Crighton" four-box center-seal, made by the Kerr Murray Manufacturing Company, of Fort Wayne, Ind. The Alton (Ills.) Gas and Electric Company is also installing a similar apparatus.

AT the annual meeting of the Pawtucket (R. I.) Gas Company a large majority of the stock was represented, and the annual reports showed that the Company enjoyed a fairly prosperous year. The Directors chosen were: James G. Fales, L. B. Darling, H. Conant, E. A. Perrin, S. A. Jencks, Olney Arnold, L. M. Darling, D. L. Goff, Jonathan Chace, E. N. Littlefield and F. W. Easton. The Directors subsequently perfected the following organization: President, L. B. Darling; Secretary and Manager, S. G. Stiness.

THE Hartford City (Conn.) Gas Light Company has paid off the mortgage of $40,000 recently given by it on its property to the Travelers' Insurance Company.

THE Judiciary Committee of the Massachusetts Legislature has reported that there was no evidence to show that the Bay State Gas Company had not complied with the Lyford bill, in respect of the decree contained in that measure directing the cancellation of a certain note.

THE Geneseo (N. Y.) Gas Company has commenced the erection of a building for its electric lighting annex, which is to be located on School street. The building will be of brick, two stories in height, of a dimension of 75 feet by 31 feet, and it is arranged to contain dynamo and power rooms and offices. It is to be covered with an iron and slate roof.

THE Canisteo Electric and Fuel Gas Company has made application for permission to pipe the city of Hornellsville, N. Y., and the Law Committee of the Common Council seems to favor the proposition. This favor, however, will not be sufficient to gain the Company its desires, for the Council, as a whole, undoubtedly is averse to turning the streets over to any set of speculators. The people most largely interested in the Canisteo fuel concern are J. M. Farquhar, of New York; ex Mayor Edson, of New York; John S. Mitchell, of Brooklyn; W. H. Harris, of Washington, D. C.; Judge Buchanan, of Trenton, N. J., and J. B. Woodbury, of Hornellsville. These names—in fact, the name of Harris alone—are sufficient to indicate the character of the enterprise.

COUNCILMAN LEIGHT, of Louisville, is very positive in his assertions that the Louisville Gas Light Company cannot, under its charter, charge a meter rent, basing his contention on Section 12 of the ordinance governing the Company, which reads: "The said Company shall furnish illuminating gas to private consumers at a price not to exceed $1.35 per 1,000 cubic feet, less a discount of 5 cents per 1,000 cubic feet to all persons paying their bills within 5 days after same are due." This provision, so Mr. Leight asserts, is the only one in the charter referring to what the Company may charge ordinary consumers; but, on the other hand, possibly the Company has the right to do any reasonable thing respecting which the charter is silent.

A DECIDEDLY unique damage suit is reported from Pittsburgh, Pa., in which Jennie Hoehle asks the Court to award her $10,000 damages for the death of her husband, the defendant being the Allegheny Heating Company. In October, 1891, her husband became ill, and on October 27, 1891, the Company shut off the gas supply from the Hoehle premises, because of a delinquent gas bill. The husband's illness was aggravated owing to the lack of heat in his apartments, and his death ensued on December 14, 1891. Hence Mrs. Hoehle holds the Company responsible.

THE tar working plant of the Milwaukee Gas Light Company was badly damaged by fire on the morning of the 5th inst., and Jas. Conway received severe injuries in attempting to stop the headway of the flames.

THE electric annex of the Warren (Pa.) Gas and Electric Light Company, which was totally destroyed by fire, is being rebuilt. The loss amounted to about $15,000.

THE new electric light station for the Flatbush (N.Y.) Gas Company will be 60 feet wide and 73 feet long, divided into a dynamo room and boiler house. The roof of the building will be furnished by the Berlin Iron Bridge Company, of East Berlin Conn., and it is to be covered with the Bridge Company's anti-condensation corrugated iron roof covering.

THE Boston *Herald* says that the Bay State Gas Company has sold more gas since the price was made $1 per 1,000 cubic feet, than in any corresponding period in its history, notwithstanding the depressed times and the consequent tendency to economize. Notwithstanding the competition of the Brookline Company, the Bay State Company has more meters in service than ever before; another proof that competition increases consumption.

THE formal reorganization of the Doylestown (Pa.) Gas Company has been completed, the following officers having been named to manage the enterprise: President, Henry Lear; Secretary, Henry S. Murfit; Treasurer, John Yardley; Executive Committee, Alfred Paschall, A. F. Schutz, W. H. Kirk, Fred. Constantine and Samuel Z. Freed.

THE arbitration of the case of the Cincinnati Edison Electric Company and the city, according to the *Commercial Gazette*, came up before Messrs. Joseph T. Carew, C. B. Matthews and Miller Outcalt, on the 9th inst. The city was represented by President Aug. Herrmann, of the Board of Administration, and John B. Washburn, of the same Board, while Corporation Counsel Fred. Hertenstein and his assistant, Frank Dinsmore, represented the Board in a legal way, ex-Governor Foraker appearing in behalf of the Electric Light Company. City Electrician Cabot was also present, as was G. B. Matthews, of the Electric Light Company. Mr. Matthews was chosen by the Company, Outcalt by the city, and Mr. Carew by the two just named. It was agreed that the Board of Administration is a proper constitutional body, and Mr. Foraker then told the story which led up to the final request for the settlement of the case by arbitration, and the contract of the Company with the city was introduced. It seems that on Jan. 23, last, the Company declined to proceed further with the work until the city admitted the Company's claims, or allowed the whole matter to be arbitrated. The city, it was claimed, declared that the Company was not carrying out the contract let. The Company denied the right of the city to compel the joint use of poles by competitive companies, and it was asserted that if the city has the power to grant such rights it must be to such companies as hold regular franchises. Holding that the city had not the right to give the Cincinnati Electric Company a franchise would be another point to consider. The Edison people held that they were required to place their wires on the poles of the Cincinnati Electric Company. The ex-Governor said that his client had been hampered in the carrying out of its contract, particularly in regard to the limiting of the wires to be placed upon the cross-arms, it being required that a hood should cover the lamps when a weather-proof lamp was to be used. The contract stipulated that within 12 months after the date of the agreement all that part of the city included within Court street, the Ohio river, Eggleston and Central avenues should be lighted. The Company claimed in order to do this it would be necessary to use the poles of the Cincinnati Electric Company, but this Company exacted terms that prevented the Edison people from carrying out their contract with the city authorities. Then the ex-Governor proceeded to show that the Board of Administration had declared that the Edison Company was doing its work in bad faith and making no particular effort to carry on the work under agreement. The Corporation Counsel was directed to proceed against the Edison Company unless it went ahead with the work. On January 23, last, the ex-Governor addressed a communication to the Board stating that the Company would not proceed further unless the city conceded certain rights claimed by the Company. It was stated that arbitration might be resorted to in case no decision could be reached otherwise. The next day the Board replied that it was aiming to stop the erection of any more poles than were absolutely necessary in maintaining the electric lighting of the city. It was further stated that in order to obviate any disagreement or trouble, the Edison Company would be aided in any way possible. A lot of matter was submitted to the arbitrators bearing on the contract and communications growing out of the same. A communication from the City Electrician notifying the Company that it would not be allowed to string wires on Ninth street and Walnut street, to the premises of the Young Men's Christian Association, because the Company had underground conduits, was offered. The Board disputed, it was said, every claim the Company made, and the matter could not be settled without arbitration. On May 4, last, George B. Kerper sent a communication to General Hickenlooper, President of the Cincinnati Gas Light and Coke Company, making a proposition to buy that Company's poles and wires on Gilbert avenue to McMillan street, and on Windsor street to Kemper lane and in Eden Park. A reply was made that the property in question was not for sale, but a joint use of the same could be made upon the payment by the Edison people to the Gas Company of a fair compensation based upon mutual and reciprocal rental obligations covering the city electric lighting. Following the statement of ex-Governor Foraker, Corporation Counsel Hertenstein made a lengthy statement of the city's side of the case. He offered in evidence a lot of communications, and several times during the presentation of the case legal squabbles were indulged in, and frequent reference to the city ordinances and court decisions bearing upon lighting matters was necessary. The matter was adjourned to a named day, following which the arbitrators will sit every day until the case is concluded. Both sides have defined their position, and the next thing to come is evidence from witnesses, experts, and so on, and the hearing in all probability will take several days. The whole electric lighting of the city will in all likelihood be considered, and it is thought some very interesting testimony will be elicited.

THE new boiler house for the Coe Brass Manufacturing Company, at Torrington, Conn., will be built by the Berlin Iron Bridge Company, of East Berlin, Conn.

PADUCAH, Ky., despite the experience of other municipalities in the matter of operating electric lighting plants on public account, is anxious to have a try at the plan, and proposes to raise the necessary funds by means of a direct assessment.

MR. THOMAS G. LANSDEN has entered a suit for $50,000 damages against the Washington (D. C.) Gas Light Company, plaintiff asserting that an article reflecting upon him, which was published some time ago in a certain paper published in this city, and edited by Mr. E. C. Brown, was inspired by the defendant.

A PINTSCH gas plant is to be established at Columbus, Ohio, which plant will likely be under the control of the Columbus Gas Company.

THE City Gas Board, of Wheeling, West Va., is wrestling with the problem of how to sell gas cheaply, and at the same time make sufficient money to keep the municipal electric lighting annex on its legs. It is a decidedly difficult proposition to take care of satisfactorily, as is best explained by a remark made by Mr. Holliday at a recent meeting of the Finance Committee of Councils: "If you will provide for the running expenses of the electric plant, we can furnish gas to consumers at 50 cents per 1,000 cubic feet."

AT a joint meeting of the Sub Committees on Law and Gas, of Philadelphia City Councils, the three ordinances submitted some time ago by Mr. William F. Brown (which ordinances were printed in full in the JOURNAL at the time of their presentation) were considered. Briefly stated, the first authorized the Mayor to enter into a contract for an increased supply of gas; the second authorized a loan of $2,500,000 to establish two gas plants, one to be located at Point Breeze and one at the 25th Ward gas works; the third authorized the advertising for bids. After Mr. Brown had stated he did not believe in paying a price greater for gas than that at which the city could manufacture it, Director Windrim was called upon for information. The Director said that $1,080,500 was asked in the appropriations for improvements to the present plants. The daily capacity of the 9th Ward works was 6,600,000 cubic feet, and that of the 26th Ward works was about 6,000,000 cubic feet. At the latter plant benches capable of producing 2,000,000 cubic feet were idle, because of lack of holder capacity. The total capacity of all the works is 16,800,000 cubic feet per day, and the consumption now per 24 hours was 10,000,000 cubic feet; but in the winter time the consumption often came up to the full producing capacity. He said the holder capacity should be increased at least 5,000,000 cubic feet. After some further discussion, Mr. Clay stated he did not think the city could make gas as cheaply as it could be purchased, and the Committee evidently agreed with him; for, on motion of Mr. Chew, it was decided to return the ordinances with negative recommendations.

THE dollar gas rate for Detroit, under the new ordinances governing the Detroit Gas Company, goes into effect on July 1st.

THE Citizens Gas Company, of Dunmore, Pa., has been incorporated by Messrs. C. G. Boland and T. H. Collins, of Scranton, John Flamison, of Wilkes-Barre, and T. E. Boland and E. J. Lynett, of Dunmore.

THE AMERICAN GAS LIGHT JOURNAL

MONDAY, JUNE 18, 1894.

The Market for Gas Securities.

The market for city gas was quite erratic during the week, Consolidated displaying marked irregularity, although the fluctuations were within a narrow range. The net result, however, is a loss of one quarter point in the bid price, the opening to-day (Friday) having been made at 133¾ to 134¼. The outlook for city shares seems to be in the direction of lower prices, although Mutual is undeniably strong, at 152 bid. The Company has just declared its regular semi-annual dividend of 3 per cent., and also an extra dividend of 2 per cent., both payable on and after July 10th.

Brooklyn shares are reported at quotations unchanged from those of last week; in fact, if any change can be detected, the market for them looks healthier than has been the case for some weeks. Close observers assert that the war of rates will not last much longer, and everyone on this side of the river is agreed that it should never have been started. Consumers, of Jersey City, is quoted at 58 to 60, and the Company has declared a dividend of 2 per cent., payable July 2d, at the office, 109 Montgomery street, Jersey City. Transfer books close June 23d, to be reopened July 3d. Chicago has been soaring lately, the highest point in many months having been reached in it this week, when it sold at 79½. At time of writing it is bid for at 77⅞. Consolidated, of Baltimore, shows no change; Buffalo Mutual is bid for at 120; and Bay State is up to 16½ to 17. The East River financiers are seemingly very anxious to dispose of their first mortgage bonds, but investors appear to be wary; meanwhile, we understand that there is trouble in the tunnel once more.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

June 18.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	133¾	134¼
Central	500,000	50	100	—
" Scrip	220,000	—	100	--
Equitable	4,000,000	100	185	188
" Bonds	1,000,000	—	106	108
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	152	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	31
Preferred	5,000,000	100	76	78
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	107
Citizens	1,200,000	20	50	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co.	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	130	132
" Bonds	300,000		103	—
Peoples	1,000,000	10	—	70
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	132	136
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	—	160
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	138	145
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	16½	17
Income Bonds	2,000,000	1000	60	—
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	78	—
2d " " "	3,000,000	1000	57	58
Buffalo Mutual, N. Y.	750,000	100	120	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	76⅝	76¾
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Consumers Gas Light Co., Jersey City	2,000,000	100	58	60
Bonds	600,000	1000	90	95
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal.			90	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	63½	64
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
Con. Bonds	.....	.....	60	—
East River Gas Co., Long Island City	1,000,000	100	—	—
Bonds	500,000	100	89¼	—
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	190	200
Louisville, Ky.	2,570,000	50	125	130
Laclede Gas Light Co. St. Louis, Mo.—				
Common Stock	7,500,000	100	17¼	17¾
Preferred "	2,500,000	100	68	68¾
Bonds	9,034,400	1000	86½	87
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
New Haven, Conn		25	200	—
Oakland, Cal.			42⅝	43
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Peoples, Jersey City		—	160	170
" " Bonds			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal.	10,000,000	100	71	71½
Washington, D. C.	2,000,000	20	240	—
Wilmington, Del.	500,000	50	180	182

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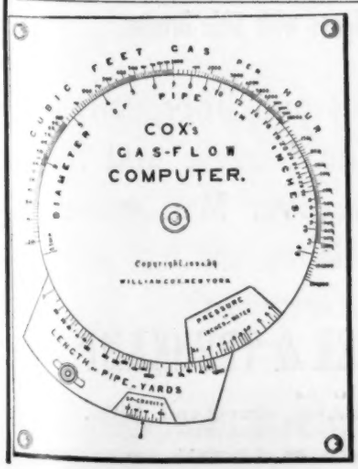

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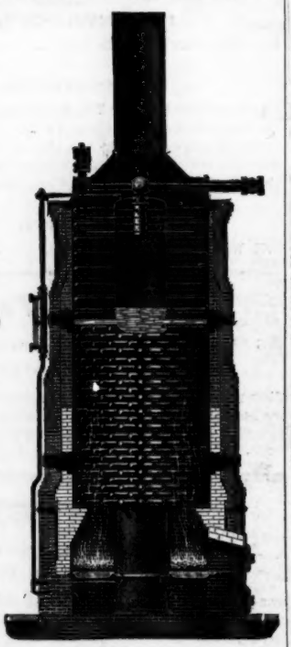

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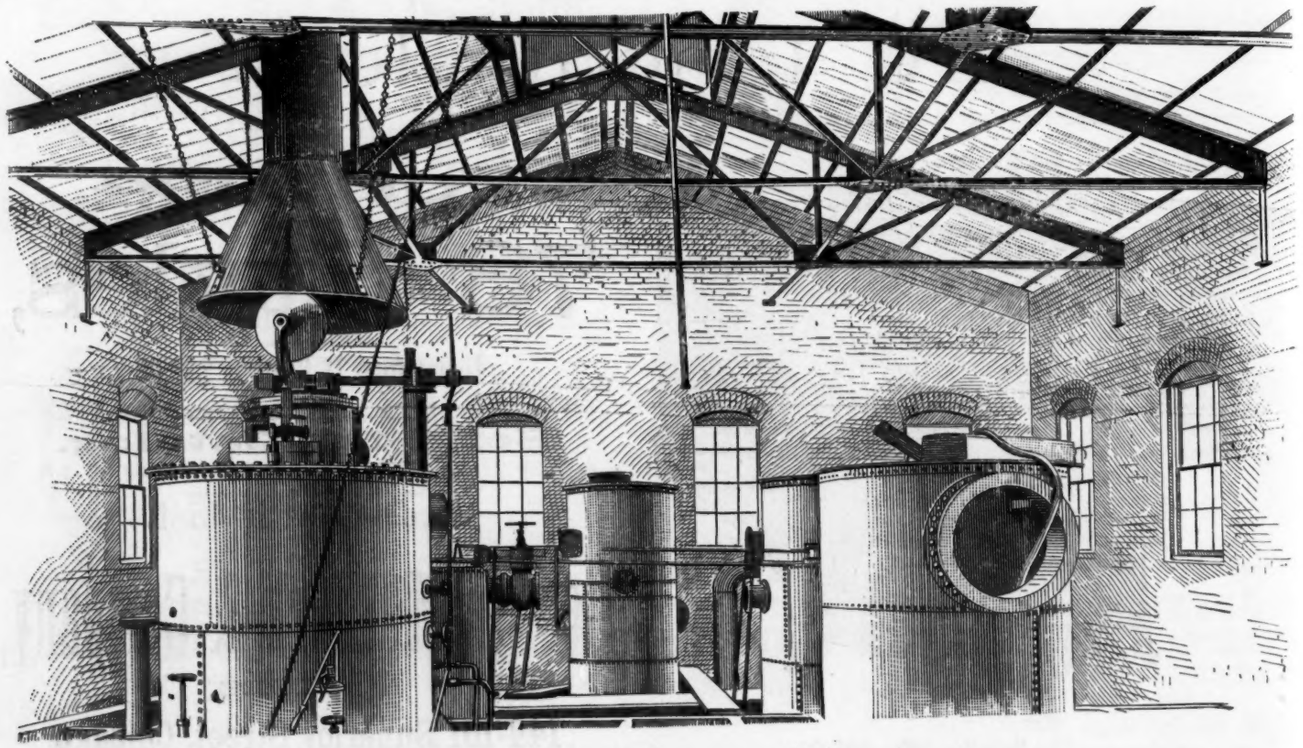

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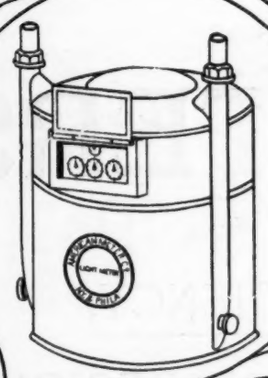

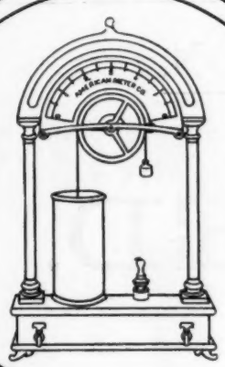

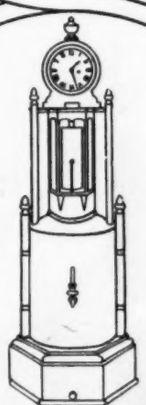

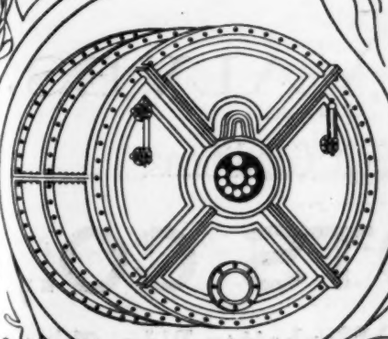

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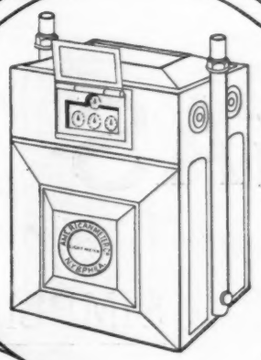
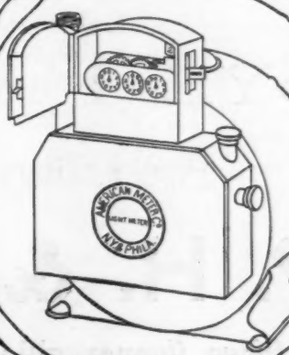
JULY, 1894.

Day of Week.	Table No. 1. Following the Moon.			Table No. 2. New York City. All Night Lighting.	
	Date.	Light.	Extinguish.	Light.	Extinguish.
				P.M.	A.M.
Sun.	1	8.00 PM	3.40 AM	7.30	3.15
Mon.	2	8.00	3.40	7.30	3.15
Tue.	3	8.00 NM	3.40	7.30	3.15
Wed.	4	8.00	3.40	7.30	3.15
Thu.	5	8.00	3.40	7.30	3.15
Fri.	6	8.00	3.40	7.30	3.15
Sat.	7	8.00	3.40	7.30	3.15
Sun.	8	10.10	3.40	7.30	3.15
Mon.	9	10.30 FQ	3.40	7.30	3.15
Tue.	10	10.50	3.40	7.30	3.15
Wed.	11	11.20	3.40	7.30	3.15
Thu.	12	11.50	3.40	7.30	3.15
Fri.	13	12.30 AM	3.40	7.30	3.15
Sat.	14	1.10	3.40	7.30	3.15
Sun.	15	2.00	3.40	7.30	3.15
Mon.	16	No L.	No L.	7.20	3.15
Tue.	17	No L. FM	No L.	7.20	3.15
Wed.	18	No L.	No L.	7.20	3.15
Thu.	19	8.00 PM	9.50 PM	7.20	3.15
Fri.	20	7.50	10.10	7.20	3.15
Sat.	21	7.50	10.30	7.20	3.15
Sun.	22	7.50	10.50	7.20	3.15
Mon.	23	7.50	11.10	7.20	3.15
Tue.	24	7.50	11.40	7.20	3.15
Wed.	25	7.50 LQ	12.00	7.20	3.15
Thu.	26	7.50	12.30 AM	7.20	3.15
Fri.	27	7.50	1.10	7.20	3.15
Sat.	28	7.50	2.00	7.20	3.15
Sun.	29	7.50	4.00	7.20	3.15
Mon.	30	7.50	4.00	7.10	3.30
Tue.	31	7.50	4.00	7.10	3.30

TOTAL HOURS LIGHTING DURING 1894.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	244.10	January	423.20
February	195.30	February	355.25
March	206.20	March	355.35
April	169.40	April	298.50
May	162.10	May	264.50
June	135.40	June	234.25
July	146.30	July	243.45
August	162.20	August	280.25
September	174.10	September	321.15
October	211.20	October	374.30
November	221.00	November	401.40
December	245.30	December	433.45
Total	2274.20	Total	3987.45





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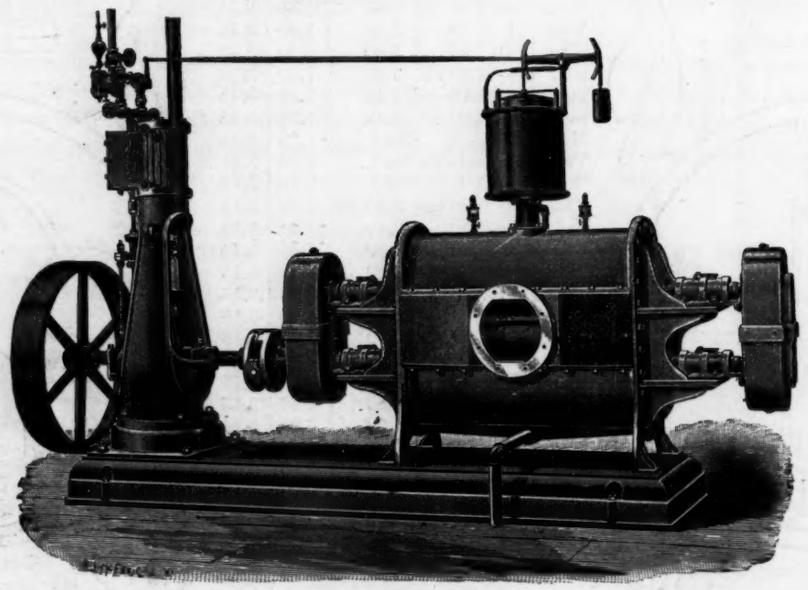

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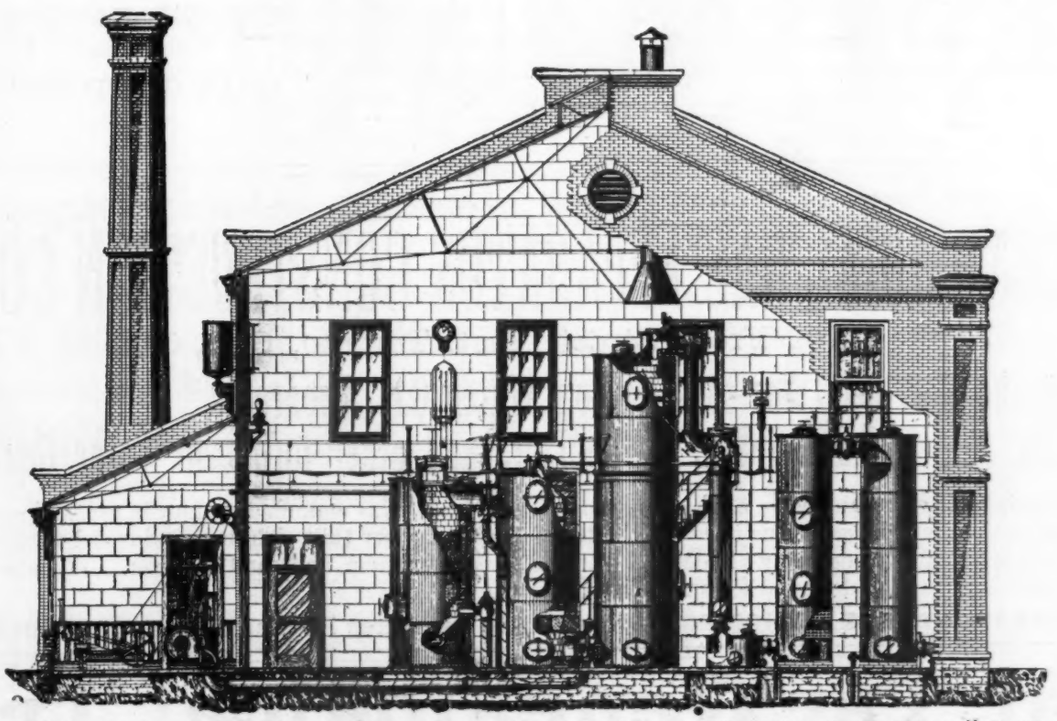

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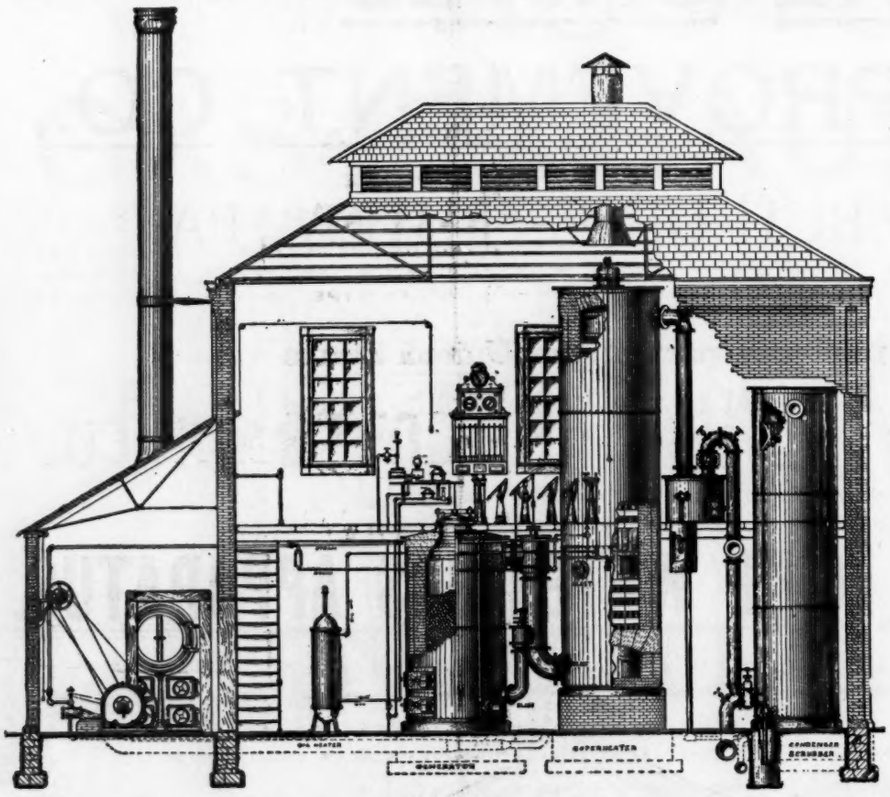

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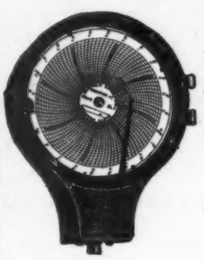

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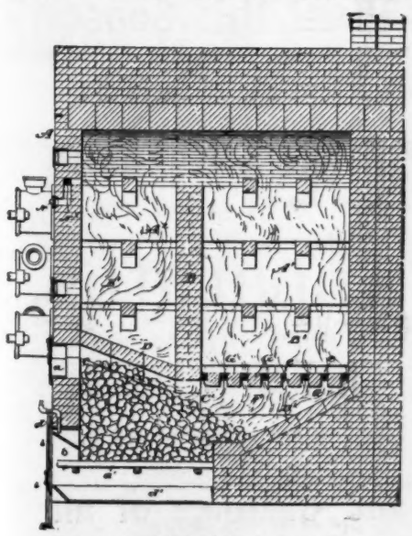

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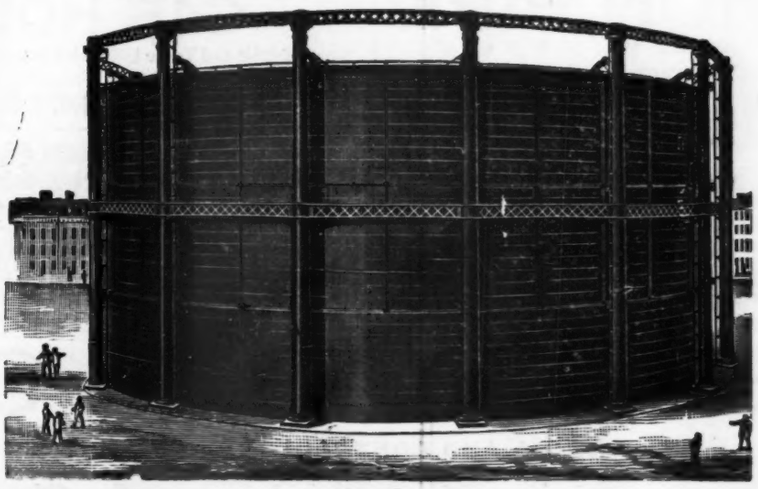

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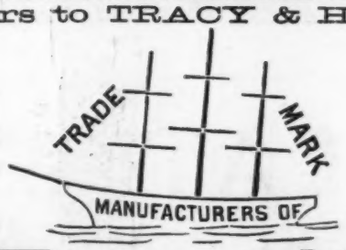

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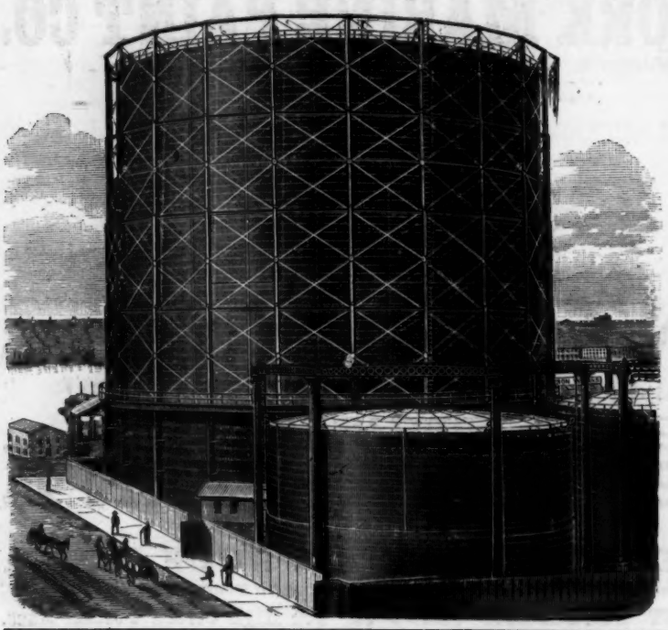

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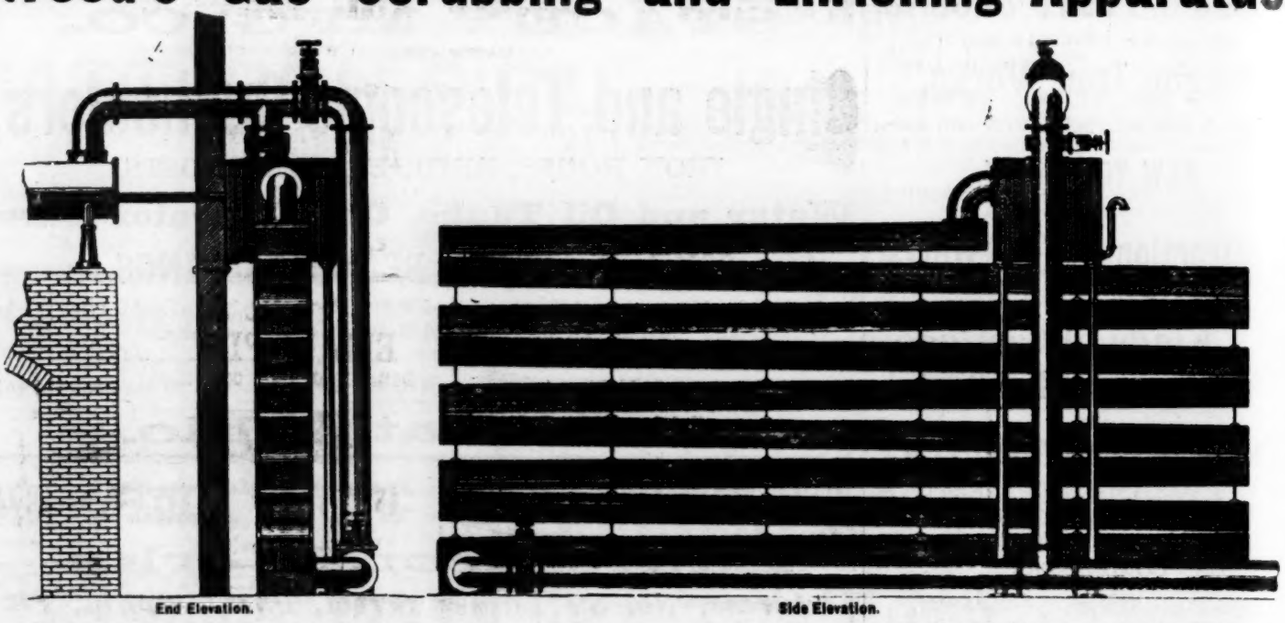

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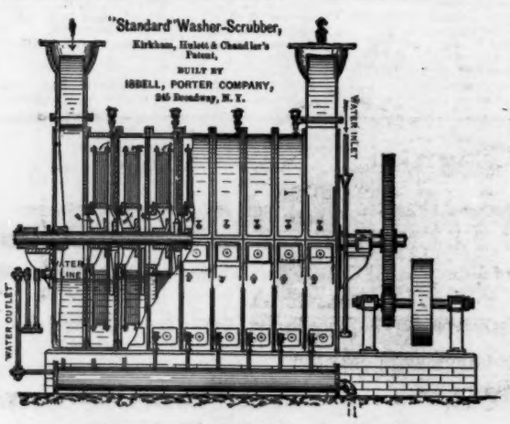

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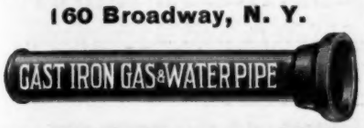

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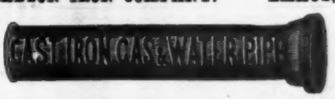

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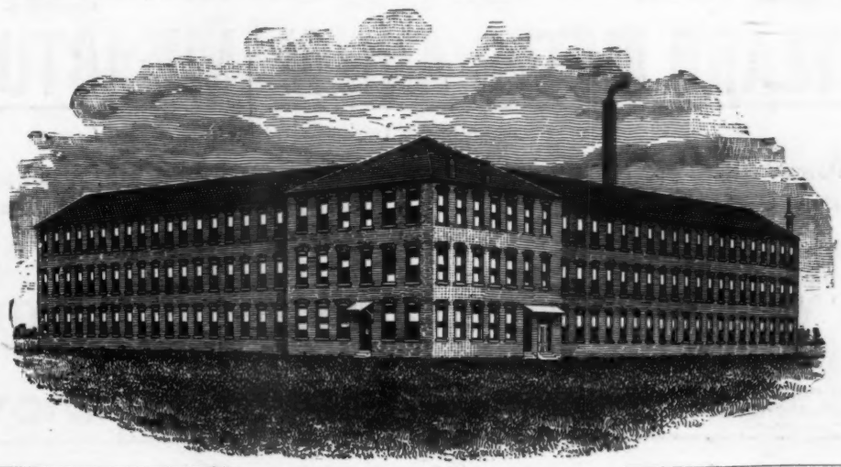

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